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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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76-0307. Anonymous. **Gemeinsame Stellungnahme der Biologischen Bundesanstalt Braunschweig und des Bundesgesundheitsamtes Berlin zum Einsatz von Wuchsstoffherbiziden im Forst. [Joint opinion of the Biologische Bundesanstalt Braunschweig and the Federal Department of Health in Berlin concerning application of herbicides in forests.]** *Allg. Forstz.* 30(45): 976-978; 1975. (German)

A joint statement by the Federal Institute of Biology in Braunschweig and the Federal Department of Health in Berlin is presented concerning the use and hazards of phenoxycarboxylic acid-derived herbicides in forests. The aerial distribution of such herbicides is permissible and is even recommended in view of increased uniformity of application and reduced poisoning risks for the operator as compared with conventional methods of application. Herbicides containing 2,4,5-T should be used in water collection areas only if the flow time of the water before capture is longer than 50 days. If applied according to the instructions, such herbicides present no threat to honeybees. Nectar and honey samples collected from 2,4,5-T-treated areas contained residues at a detection limit of 0.005 ppm. Experiments on laboratory, domestic, and game animals seem not to indicate any hazards from growth-regulating compounds if applied according to instructions. It was not possible to confirm certain experimental results indicating embryotoxic effects of 2,4-D in fowl. The teratogenic dose of 2,4,5-T has been determined as 20 mg/kg/day; thus this pesticide presents no teratogenic threat to humans. On the other hand, the dioxin content in 2,4,5-T can be limited to 0.1 ppm. There are no indications of mutagenic hazards due to 2,4,5-T in humans. In forests with wild berries, 2,4,5-T should be applied before flowering or after the berries are harvested.

76-0308. Hall, D. C.; Norgaard, R. B.; True, P. K. (Dep. Agric. Econ., Univ. California, Berkeley, CA). **The performance of independent pest management.** *Calif. Agric.* 29(10): 12-14; 1975.

It has been suggested that cotton and citrus growers can reduce the amounts of pesticides used on their crops and increase their returns/acre by following the advice of independent pest management consultants. Integrated pest control programs endeavor to reduce the use of pesticides which have been specifically recognized as harmful to health and the environment. A universal aim of such groups is to avoid unnecessary spraying in order to prevent killing beneficial insects and thereby prevent subsequent pest resurgence which would necessitate further spraying. In order to evaluate the profitability of employing a consultant service, a random sample of San Joaquin Valley cotton growers was interviewed. The results of these interviews indicated it was usually the more experienced farmer with the larger farms who hired a consultant to aid in this pesticide planning. In calculating the financial returns to cotton growers, it was determined that over the two year period of usage, those who used pesticide consultants spent an average of $7.00 less/acre on chemical insecticides than those who did not use such consultant services. Considering the increased yield and reduced insect control costs, those who used consultant services earned an average net amount of $16.78 more/acre in 1970 and $65.32 more/acre in 1971 than did nonusers. Whether this was all due to the use of pesticide consultants or also includes the use of other farm management factors is not certain. A similar study of 39 orange growers in the San Joaquin Valley concluded that these growers can also increase profits by using these services.

76-0309. Cooper, P. (Author address not given.) **Living with polychlorinated biphenyls.** *Food Cosmet. Toxicol.* 13(5): 574-578; 1975.

Studies concerning the presence of PCBs in the environment and human exposure are reviewed. PCBs can be produced by the irradiation of DDT vapor with ultraviolet-light as present in sunlight. Sewage treatment is a further source. A study conducted in Vienna of human perirenal fatty tissue obtained from 32 post-mortem samples indicated a mean concentration of 3.5 ppm PCBs with a range of 0.3 ppm to 8.5 ppm. Associated with the PCB level was a 5.8 ppm total DDT and DDE count. The long retention of PCBs in body fat poses the question of how much may be excreted into breast milk and passed on to the infant. Many studies have been concerned with the routes of entry of PCBs into the food chain. Seas and lakes contain low concentrations of PCBs. The concentration of PCBs in plankton has been described. From plankton, PCBs enter fish and seabirds. It is not certain whether whales ingest PCBs in their plankton diet or absorb them directly from the water. However, widespread oil pollution of the North Atlantic may produce an enriched surface stratum from which lipid-soluble contaminants, including PCBs, might be absorbed. A study of PCBs in lake waters in South Dakota indicated organochlorine insecticides in bottom sediments were 7 times more plentiful than in the water, while fish in the lakes contained concentrations of PCBs 12 times higher than in these bottom sediments. This indicates a concentration gradient rising in the food chain. In human foodstuffs the most frequently contaminated was freshwater fish. PCBs enter human food also by means of packaging. Methods of changing the packaging of foodstuffs to reduce this source of contamination have been undertaken. Contamination of animal feeds may result from exposure during production, processing, or storage. It is suggested that PCB contamination may be less severe than it seemed a few years ago. It is urged, however, that a close watch be kept on this situation.

76-0310. Gibney, L. Y. (Chem. Eng. News, Washington DC.) **EPA broadens approach to pesticide decisions.** *Chem. Eng. News* 53(44): 15-16; 1975.

In two recent memorandums to assistant and regional administrators and office directors of the Environmental Protection Agency, the agency's administration has outlined changes that are to occur in the manner in which future cancellations and suspension decisions on

pesticides are to be executed. Changes are also in the making regarding the interpretation of what constitutes carcinogenicity. A heavy reliance on outside consultation is stressed, which is a significant departure from the past policy of the agency. The first memo calls for open evaluation of risks and benefits prior to the decision to suspend or cancel a pesticide. Experts from external scientific and technical associations would be invited to give their opinions. The second memo defines a new approach to the agency's treatment of carcinogens. Nine guidelines are offered for aiding in the determination of carcinogenicity. The question of whether outside experts should be called in only to review scientific facts and analyses, or whether they should be involved in the ultimate weighing of risks vs. benefits remains to be decided.

76-0311. Anonymous. **EPA, you've gone too far.** [**Editorial**] *Farm Chem.* 138(1): 24,26,28; 1975.

An indication of the far-reaching effects of EPA decisions is presented. Evidence is offered suggesting that the agency has overstepped its intended authority. A confrontation between the Secretary of the Agriculture and the administrator of EPA is predicted. State vs. federal control of land use and pesticide applications is discussed. Even under state control, difficult days are forecast in that greater restrictions on the use of pesticides, nonavailability of pesticide materials to meet unforeseen pest problems or epidemics, greater emphasis on other pest management programs and materials, less food production, lower quality food, and higher costs of food are expected. The effect on the independent, small farmer may be too great for him to remain in business. A few specific steps are suggested for people to take in an attempt to face the EPA.

76-0312. Council for Agricultural Science and Technology CAST. (Dep. Agron., Iowa State Univ., Ames, IA 50010). **Chlordane/heptachlor. There is a no-effect level.** *Farm Chem.* 138(12): 36-37; 1975.

The LD50 values for chlordane and heptachlor indicate that these compounds are moderately toxic. No human deaths due to heptachlor have been reported. The evidence thus far obtained shows the acute threat to human safety is negligible. The long-term effect on health due to exposure to chlordane and heptachlor in the food supply is very small. Not only would it take a person more than 11,700 yr to ingest the equivalent of the estimated minimum acute lethal dose of 6 grams for an adult, but the body would have eliminated a significant amount of the residue during the course of life. Neither is there any evidence to indicate that the use of chlordane in the home and garden constitutes a significant hazard. Monitoring studies have detected heptachlor, heptachlor epoxide, and oxychlordane in samples of human blood, fat, or other tissues, in amounts in the parts-per-billion range. The concentration and incidence seem to be greatest in the fat. Currently, there is no evidence indicating that chlordane or heptachlor have induced cancer in humans. Statistically significant increases in the incidence of cancer have been reported in experiments with test animals during which they were fed heptachlor and chlordane at relatively high concentrations.

76-0313. McCormack, E. G. (Roanoke, VA). **"No difference" theory cannot go unchallenged.** *Farm Chem.* 138(12): 71-72; 1975.

In a letter to Senator W. L. Scott, the writer judges the EPA's intent to suspend registrations of pesticides containing chlordane and heptachlor as a case of product assassination through inference, speculation, and contrivance. In particular, objection is raised to the statement that a pesticide that in any amount induces tumors, no matter whether benign or malignant, in experimental animals must be considered a carcinogen to man. This statement even suggests that the terms benign and malignant should be considered synonymous. It is suggested that this "no difference" theory is the pivotal point of the EPA's case against heptachlor/chlordane. To seek a ban on a pesticide for the reason that a benign tumor may develop into cancer is an irresponsible departure from scientific procedure. The distinction between benign and malignant tumors is basic to the determination of what is or what is not a carcinogen.

76-0314. Jukes, T. H. (Berkeley, CA). **The EPA head Russell Train: new DDT report whitewash of erroneous decision.** *Farm Chem.* 138(12): 72; 1975. (3 references)

The EPA news release "Environmental News" on DDT stated that the human dietary intake of DDT in the U.S. has declined from 13.8 mg/day in 1970 to 1.88 mg/day in 1973. While up to 35 mg/day for prolonged periods is harmless to humans, the human dietary intake of DDT in the U.S. is in reality only 1/1000 of the range claimed in EPA's news release. The same release indicated that DDT levels in lake trout and coho salmon have also decreased, but failed to mention that the decrease may have been due to the reduced agricultural use of DDT that preceded the ban. Also, while methyl parathion and parathion are mentioned as alternatives to DDT, the fact that these pesticides have caused a number of human deaths is not mentioned. The release then went on to say that DDT was banned because of unreasonable adverse effects on man; in fact, no such effects exist. A World Health Organization statement in April 1971 indicated that the safety record of DDT for man is truly remarkable. The environment for human beings has deteriorated as a result of the banning of DDT.

76-0315. Winteringham, F. P. W. (Author address not given). **What can radioisotopes do for man? Part 4. Food and environmnental quality protection.** *I. A. E. A. Bull.* 17(5): 14-25; 1975.

The use of isotopes in food and environmental quality protection is discussed. In combination with

chromatographic and other fractionation techniques, radiotracer techniques are widely used for basic studies of the behavior, fate, and significance of pesticide residues which find their way as trace contaminants into food, environment, and living organisms. The use of these techniques has made a major contribution to our understanding of the behavior and significance of chemical and radioactive contaminants and of the capability of the environmental ecosystems to receive such contaminants without unacceptable effects. Isotopic techniques are used for two basic types of studies: tracer studies in which a contaminant or pollutant labeled with stable or radioactive isotopes is added to the system to study its behavior and its fate under experimental or simulated conditions of practice; and second, as a monitoring tool for studying an existing contamination or exposure situation. The current status and potential of isotope techniques as an aid to food and environmental quality protection and research are briefly illustrated.

76-0316. Brugger, J. E.; Wilder, I. (U.S. Environ. Protect. Ag., Ind. Waste Treatment Res. Lab., Edison, NJ). **A review of the U.S. Environmental Protection Agency's research program on the prevention and control of hazardous material spills.** *J. Hazardous Materials* 1(1): 3-19; 1975. (4 references)

Recent projects at the Industrial Waste Treatment Research Laboratory of the U.S. EPA in Edison, N.J. have resulted in the documentation and analysis of actual causes of numerous hazardous material spills; the development of spill alert systems for marginally safe earthen holding pond dikes; the evaluation of fail-safe systems designed to reduce spillage from overfilling and from transfer line rupture; and analysis of the handling of spills in municipalities. Among the physical and chemical treatment systems being produced are trailer-mounted units for processing contaminated water, special devices for the dispersion and recovery of adsorbents and counteractive chemical reagents, plastic foams for use in confining spills and plugging leaks in ruptured containers, and a pickup truck-mounted collection unit. Nearing final testing is a "Sea Curtain" which can be used to isolate a water column that is being contaminated. In addition, agents have been developed for immobilizing spilled materials, systems are being built to reprocess or detoxify agents, and procedures are under test for enhanced, in-place, biological degradation of spilled materials.

76-0317. Herfs, W. (Biol. Bundesanst. Land-Forstwirtsch., Inst. Zool. Mittelpruefung, Braunschweig, Germany). **Die Zulassung von Pflanzenschutzmitteln mit Nutzarthropoden schonenden Eigenschaften sowie die fuer die Zulassung erforderlichen Voraussetzungen in der Bundesrepublik Deutschland. [The approval of pesticides for plant protection with selective qualities to beneficial arthropods and the necessary suppositions for the approval in West Germany.]** *Nachrichtenbl. Dtsch. Pflanzenschutzdienstes (Braunschweig)* 27(10): 152-155; 1975. (13 references) (German)

According to the provisions of the Plant Protection Law of West Germany, the testing of pesticides with respect to their effects on useful arthropods will be a part of the normal testing and homologation procedure imposed on pesticides as of 1975. The basic guidelines for the laboratory tests have been elaborated by a special working group. The standard arthropods used in these tests are *Trichogramma cacoeciae, Coccygomimus (=Pimpla) turionellae, Phygadeuon trichops,* and *Coccinella septempunctata*. If the results of the laboratory tests are unsatisfactory, the testing may be continued in field tests for which guidelines will be worked out in the near future. Tests in tents are also envisaged.

76-0318. Nagasaki Prefectural Office (Nagasaki, Japan). **[Environmental pollution by pesticides (Chapter 8). Part 1. Present state of problems of environmental pollution by pesticides.]** *Nagasaki-Ken Kankyo Hakusho (Environ. White Paper, Nagasaki Pref.)* 165-168; 1973. (Japanese)

Environmental pollution by pesticides was historically described from the viewpoint of usage and development of synthetic pesticides. The amounts (in tons) of organomercury pesticide formulations applied yearly in Nagasaki Prefecture from 1953 to 1972 were 132, 230, 275, 227, 288, 237, 202, 224, 226, 327, 580, 409, 431, 315, 268, 13, 6, 4, 3, and 4; the total amount was 4402 tons. Since organomercurials and organochlorines were banned and strong restrictions were placed on pentachlorophenol as a herbicide, low toxicity organophosphates, *N*-methylcarbamates, and low-fish-toxicity herbicides are now applied instead.

76-0319. Wiswesser, W. J.; Creager, R. A.; Windlinx, K. J. (Edgewood Arsenal, Aberdeen Proving Ground, MD). **A chemical-biological data base for herbicidal information.** *Nat. Tech. Inform. Serv. AD A* 003 254, 1974, 24 p. (28 references)

This report describes a system of computer programs that builds, checks, maintains, and retrieves from a chemical-biological data base on compounds that have been tested for herbicidal activity. The system started with a CDC 3150 computer in 1970, and is now implemented on a CDC 3300 computer. The data base now has over 30,000 records of biological activities and chemical structure descriptions. The computerized storage and retrieval system is capable of searching, summarizing, and analyzing information on the effects of chemicals on vegetation. (Author abstract by permission)

76-0320. Feates, F. S.; Kantyka, T. A. (Elsevier Sci. Publ. Co., Amsterdam, The Netherlands). **Editorial. [New journal announcement.]** *J. Hazardous Materials* 1(1): 1-2; 1975/76.

The Journal of Hazardous Materials will bring together original papers covering the use of disposal of potentially hazardous materials and means of preventing incidents involving hazardous materials. Relevant national and international legislation will also be reviewed, with indications of trends and cooperative ventures. Papers covering the properties of various hazardous materials will be published, as will those dealing with economic and general risk assessment, insurance, and test methods. Papers of scientific merit which have been presented at conferences will be of particular interest, and contributions to a proposed correspondence section will be welcomed. In addition, book reviews will appear regularly along with details of forthcoming conferences.

76-0321. Kraybill, H. F. (Natl. Cancer Inst., Bethesda, MD 20014). **Pesticide toxicity and potential for cancer: a proper perspective.** *Pest Contr.* 43(12): 10-16; 1975. (23 references)

A pesticide is termed a potential carcinogen based on the results obtained in laboratory studies on animals. None of the pesticide chemicals has thus far been shown to be carcinogenic to man. It is vital that critical appraisal of the validity of such laboratory findings be made. In order to accept the experimental procedures necessary to make such studies, the procedures must have a credible design. One must not become preoccupied with the response to a pesticide at a high dose challenge, but should perceive the possibility of lack of response at a low dose level. Adaptive response, at a low dose, should not necessarily be judged as an injury, but as a beneficial defense mechanism. It is impractical to search for zero exposure. Time and energy must be spent in the interests of defining an acceptable level of risk. Since there are no human studies, the decisions made must be based on interpretation and extrapolation from the animal experience. In the final stages of the analysis, potential risks of a pesticide's use must be weighed against benefits.

76-0322. Brooker, M. P. (Dep. Appl. Biol., Univ. Cambridge, Cambridge, England). **Ecological effects of the use of aquatic herbicides in Essex.** *Surveyor* 146(4348): 1975. (16 references)

Comparative costs of herbicide use and conventional hand maintenance are discussed and research results reviewed which are of importance in forming a sensible strategy for a management program, considering economic costs, drainage functions, public and agricultural water supply, and conservation. The conventional method of clearing emergent plants from drainage channels had been cutting and removing by hand. The experimental use of herbicides over the past 6 yr has indicated that substantial savings can be made in comparison to the conventional methods. The economic savings due to the use of herbicides is still on the order of 25-50% each year in spite of the rising chemical costs. Until further toxicological evaluations are available, the use of herbicides in water abstracted for potable supply is not likely. Studies have shown that the replacement plant species which become established following the destruction of *Phragmites* with herbicide support higher densities of some aquatic invertebrates. There is a problem with conservation of the food supply for some species of birds. There appears to be some danger to wildlife if these herbicides are used on a wide scale. There is no reason, however, why a satisfactory balance between methods of maintaining adequate drainage and the environmental impact of such methods cannot be achieved taking into consideration a wide range of factors.

76-0323. Preston, A. (Min. Agric., Fish. and Food, U.K.). **Marine Pollution.** *Trans. Inst. Mar. Eng., Suppl.:* 1-5; 1974. (25 references)

The main categories of pollutants are discussed in terms of marine pollution. Chlorinated hydrocarbons which enter the marine environment may be highly toxic, persistent, and bioaccumulative. That they continue to enter the system in signficant quantities is a problem, but there is some evidence that they are beginning to be brought under control nationally by limiting manufacture and controlling use. The more important ones of the contaminants, aldrin, dieldrin, and DDT and its derivatives, are all declining in concentration in the marine environment of the northern hemisphere. In the southern oceans, these chemicals have not yet reached their peak. River run-off following very heavy precipitation and washout of particulate material seems to be the prime carrier of the chemicals to the oceans. However, there is also widespread atmospheric contamination, principally due to the method of application as pesticides. With the exception of the effects on the breeding performance of sea birds, other effects of these chemicals have only been reported in crustacea during periods of high pollution in river estuaries. Such incidents have been infrequent and of short duration, and have followed periods of high precipitation and runoff. (From: The Effect of IMCO Pollution Regulations on Shipping, a one day conference held on Thursday, 5 December 1974.)

76-0324. Luethy, P. (Author address not given). **Zur bakteriologischen Schaedlingsbekaempfung: Die entomopathogenen *Bacillus*-Arten, *Bacillus thuringiensis* and *Bacillus popilliae*.** [**Bacteriological pest control. The entomopathogenic *Bacillus* sp., *Bacillus thuringiensis* and *Bacillus popilliae*.**] *Vierteljahrsschr. Naturforsch. Ges. Zuerich* 120(2): 81-163; 1975. (175 references) (German)

The taxonomy, culturing, and mechanism of action of *Bacillus thuringiensis* and *B. popilliae* in biological pest control are reviewed. The insecticidal activity is due to the production of secondary metabolites, such as toxins and antibiotics which are produced during the sporulation process. These metabolic by-products are excreted by *B. thuringiensis* and *B. popilliae* in the form of parasporal inclusion bodies consisting of crystallized protein. In *B. thuringiensis*, the crystalline inclusion δ-endotoxin is

strictly limited to *Lepidoptera* species, while other insects and vertebrates are not harmed. The endotoxin is highly stable but is inactivated by prolonged exposure to heat. Protein components with molecular weights above 800,000, and a highly toxic fraction with a molecular weight around 100,000, which is believed to be the active toxic unit, were isolated. In addition to the crystalline endotoxin, some varieties of *B. thuringiensis* produce another compound with insecticidal activity which is secreted by vegetative cells. It is a nucleotide, and is particularly toxic for *Diptera* species. However, the practical use of this exotoxin in pest control is questionable since this substance blocks DNA-dependent RNA-polymerases which are present in all living systems.

76-0325. Reichholf, J. (Zool. Samml. des Bayer. Staat., Munich, Germany). **Schaedlingsbekaempfung zwischen Oekonomie und Oekologie. [Pest control between economy and ecology.]** *Z. Angew. Entomol.* 78(1): 10-12; 1975. (7 references) (German)

General ecological and economic aspects of pest control are discussed. The ecosystem concept is not adequately considered in the current practices of chemical pest control, and the adverse effects of pesticides on the environment are a consequence of the inadequate methods of pesticide testing procedures which are focused mainly on economic and toxicological aspects instead of on the ecosystem as a whole. Therefore, there is now an urgent need for revising the aims and methods of pest control within the more appropriate framework of biological-ecological systems analysis. Pest control should consider the dynamics of and the laws governing biocenoses. In the long run, any pest control practice is uneconomical if priority is set on maximum crop yield instead of an an optimal balance between crop production and ecological requirements.

76-0326. Franz, J. M. (Inst. Biol. Schaedlingsbekaempfung, Biol. Bundesanstalt fuer Land- und Forstwirtschaft, Darmstadt, Germany). **Integration als Aufgabe—Bemuehungen um eine zeitgemaesse Schaedlingsbekaempfung. [Integration as mission—efforts to achieve timely pest control.]** *Z. Angew. Entomol.* 78(1): 17-20; 1975. (German)

General problems and possibilities of integrated pest management as an up-to-date method of pest control are discussed. Integrated pest control implies the use of all means and methods to control pests in a compatible and mutually complementing manner, with equal emphasis on economical and ecological aspects. Selective means of pest control, and combinations of chemical, physical, and biological methods will be required. Instead of striving for simple general solutions and alternatives, small steps should be taken towards integrated pest control.

76-0327. Gasser, R. (Ciba-Geigy AG, Basel, Switzerland). **Chemische Schaedlingsbekaempfung. [Chemical pest control.]** *Z. Angew. Entomol.* 78(1): 20-27; 1975. (6 references) (German)

Current and future problems of pest control are discussed with special regard to chemical pest control. Developing countries need easy-to-handle broad-spectrum pesticides in the immediate future to increase their food production, while developed countries should step up their efforts in the study of integrated pest management with selective insecticides and acaricides, and with non-chemical pest control methods as a long-term task. The resistance to many insecticides calls for intensified research in the area of cholinesterase-inhibiting preparations which are least susceptible to produce resistance. Chemosterilants appear not to be promising due to their carcinogenicity.

76-0328. Nakagawa, M.; Nakamura, T.; Tomita, K. (Sankyo Co. Ltd., Agric. Chem. Res. Lab., Tokyo, Japan). **Photolysis of 3-hydroxyisoxazoles.** *Agric. Biol. Chem. (Tokyo)* 38(11): 2205-2208; 1974. (18 references)

3-Hydroxy-5-phenylisoxazole (hymexazole) (I) in methanol was irradiated with 253.7 nm light at room temperature while nitrogen was passed through the solution. The major product obtained was 5-phenyl-4-oxazolin-2-one (IV), and among the minor products were benzoic acid (VI) and benzoylacetamide (V); the other minor products, of which there were at least two, were not identified. The α-lactam could not be isolated. The photolysis of 3-hydroxy-5-methyl-isoxazole (VII) in distilled water with 253.7 nm light yielded 5-methyl-4-oxazolin-2-one (IX) as the major product. At least two minor products were formed, neither of which could be identified. The α-lactam again could not be isolated and the formation of acetoacetamide or acetic acid could not be confirmed. IX and IV were previously detected in "unsterilized" soils treated with Hymexazol and Isoxathion, or 3-hydroxy-5-phenylisoxazole, respectively. IV was also produced as a metabolite of I in rat liver homogenates.

76-0329. Gambettiova, D.; Kovac, J. (Vyskumny Ustav Vonohradnicky a Vinarsky, Bratislava, CSSR). **Rezidua fungicidov Euparen, Ortho-Phaltan a Benlate v hroznovej stave. [Residues of the fungicides euparen, ortho-phaltan, and benlate in grape juice.]** *Agrochemia (Prague)* 14(5): 150-152; 1974. (15 references) (Czech)

A uniform method is described for determination of the persistence time of residues of (euparen), dichlofluanid, ortho-phaltan (folpet), and benlate (benomyl) fungicides in grape juice. The method is based on diffusion zone analysis of isopropyl alcohol extracts of the fungicides in agar-agar nutrients media of fixed composition, using spores of *Botrytis cinerea* fungus as testing microorganisms. Grapes of the Mueller-Thurgau variety were sprayed on August 27, 1973 with a 0.1% concentrate of benlate, 0.25% concentrate of euparen, and 0.3% concentration of ortho-phaltan. The residues measured in grape juice 4 days after application was 2.76, 2.24 and 3.17 mg/kg, respectively. Residues of euparen vanished totally in 28 days after application and those of ortho-phaltan vanished totally in 32 days after application. A 0.2 mg/kg residue of benlate in the form of its hydrolysis product MBC was measured 42 days after application. It was established that the sensitivity of the method is limited to a concentration of 0.1 mg/kg which is suitable for determining the required quarantine period for grapes prior to the start of the fermentation process.

76-0330. Eichler, D.; Leber, G. (Firma Celamerck, Ingelheim, Germany). **Ergebnisse von 2,4,5-T-Rueckstandsuntersuchungen in Honig, Wald Him und Brombeeren, Waldhimbeerblaettern und -Graesern sowie ihre toxikologische Bedeutung fuer Mensch und Tier. [Results of 2,4,5-T residue analyses in honey, wild raspberries and blackberries, and in leaves of wild raspberries and grass as well as their toxicological importance for man and animal.]** *Allg. Forstz.* 30(45):994-996; 1975. (12 references) (German)

Honey, raspberry, blackberry, raspberry leaf, and grass samples taken from forest areas at different intervals after spraying with Tormona 80 at an expenditure of 6 kg/ha were analyzed for 2,4,5-T residues. While honey samples contained no 2,4,5-T residues at a detection limit of 0.005 ppm, raspberries and blackberries contained residue levels of 7.7-8.3 ppm on the day of the treatment, 8.1-8.3 ppm after 4 days, and 7.5-7.8 ppm for 7 days. The 2,4,5-T residue in raspberry leaves decreased from an initial level of 368 ppm to about 1% in 51 days. The residue level in grass decreased from 63.8% to about 5% in about 2 weeks, and to nearly 1% in 36 days. The findings indicate no health hazards due to the consumption of contaminated berries since at an ADI of 0.005 mg/kg/day, the consumption of 11 kg of berries with 10 ppm of 2,4,5-T yearly is totally harmless. Game animals can safely consume 2,4,5-T-contaminated grass. Tormona was found to be harmless for honeybees.

76-0331. Dagley, S. (Biochem. Dep., Univ. Minnesota, St. Paul, MN 55108). **Microbial degradation of organic compounds in the biosphere.** *Am. Sci.* 63: 681-689; 1975. (37 references)

A man-made compound will be biodegradable if it is susceptible to attack by the enzymic apparatus acquired by microbes during the course of evolution. For such to occur, the microbial enzymes must be able to accept as substrates compounds having chemical structures similar to, but not identical with, those found in nature; and the substrates, when in the presence of microbes, must be able to induce or repress the synthesis of the necessary degradative enzymes. When structural features which are never encountered in natural products are built into a pesticide molecule, biodegradability is less likely to occur. On the other hand, the addition of structural units found commonly in nature will make a compound more readily biodegradable. Therefore, biodegradability is linked inevitably with the study of both the mechanisms of induction and the modes of action of those enzymes employed for degrading natural products. Specific examples of the microbial degradation of compounds of environmental interest are given.

76-0332. Babiker, A. G. T.; Duncan, H. J. (Agric. Chem. Sect., Dep. Chem., Univ. Glasgow, Glasgow, Scotland). **Mobility and breakdown of asulam in the soil and the possible impact on the environment.** *Biol. Conserv.* 8(2): 97-104; 1975. (20 references)

The impact on the environment was investigated of employing asulam for the eradication of bracken. Both chemical and bioassay methods were used for detecting asulam residues. The effect of temperature and the depth of the soil were both considered. Degradation of asulam

occurred at all three temperatures adopted. At 25°C, 16.50% and 2.50% remained after 14 and 28 days, respectively. It was indicated that seasonal and geographical differences have a decided influence on asulam behavior. Permeability studies showed that no appreciable decomposition of asulam takes place in river water in one month, suggesting that the accumulation of asulam residues in water reservoirs could be a very important environmental hazard. This becomes increasingly important when one considers that some direct introduction of asulam into streams and rivers is inevitable at the time of spraying. An assessment of root viability demonstrated that asulam concentration decreases with time, thereby exerting less influence on root activity at initial concentrations of 12.5, 25.0, 37.0, and 50.0 ppm asulam. At the higher concentrations root branching was severely curtailed. Three suggestions are given to aid in reducing the possible environmental hazards resulting from use of asulam. First, by incorporating suitable surfactants in the spray solution, the efficiency of uptake of asulam by the bracken frond would be increased by the order of 100%, thus reducing the amount of asulam reaching the soil. Secondly, by burning the area to remove surface vegetation before spraying with asulam, the residual carbon present would greatly increase the adsorption capacity of the soil for asulam, thus removing very high concentrations of asulam from aqueous solution. Finally, the weather conditions during and after spraying must be considered.

76-0333. Wimmer, J. (Inst. Landwirtschaft. Pflanzenschutz Forst. Phytopathol., Hochschule Bodenkultur, Vienna, Austria). **Untersuchungen ueber die Wanderung und Auswaschung von Quecksilber im Boden.** [**Researches on the movement and leaching of mercury in soil.**] *Bodenkultur* 25(4): 369-379; 1974. (12 references) (German)

The migration and leaching of mercury in different types of soils was studied in laboratory tests, using ^{203}Hg-labeled mercury acetate. In one test series, mercury acetate was applied on the surface of a soil column, after which 540 or 1,080 mm of water were applied within 12 weeks. In alkaline soil columns, mercury was retained mainly in the uppermost soil layer of 10 cm thickness. Mercury penetrated into deeper layers in acid soils. The quantity of mercury found in seepage water and at 40 cm depth in the soil was only one tenth and one hundredth of the input, respectively. Up to 40% of the mercury evaporated into the atmosphere from soils with low humus contents and consequently reduced sorption capacity. In another test series, labeled mercury was distributed homogeneously in the soil column in 200 ppb concentration. The leaching was minimal in soils with pH values over 7, while percolating water from soils with pH values below 5 had considerably higher Hg concentrations. However, the absolute amounts of Hg were extremely low at levels below 2 ppb. Mercury was found to be washed out only together with humic substances and in acid soils. The findings indicate that organomercurial fungicides represent no groundwater and surface water contamination hazards.

76-0334. Baird, R. C.; Thompson, N. P.; Hopkins, T. L.; Weiss, W. R. (Univ. South Florida, St. Petersburg, FL 33701). **Chlorinated hydrocarbons in mesopelagic fishes of the eastern Gulf of Mexico.** *Bull. Mar. Sci.* 25(4): 473-481; 1975. (40 references)

Selected zooplankton collections and 1052 individuals representing 17 species of mesopelagic fishes from the eastern and northern Gulf of Mexico were analyzed for DDT, dieldrin, and PCB residues. DDT and its metabolites were found in small but measurable concentrations (less than 0.01 ppm) in all but a few samples. Dieldrin occurred more sporadically but when found generally appeared in somewhat higher concentrations than DDT. PCBs were ubiquitous and the concentrations were usually 1-2 fold higher than those of the pesticides. The PCB concentrations were as high or higher than those reported from midwater fishes from other areas, and measured organochlorine 'loads' were generally less than 1 ppm. No consistent geographic pattern was apparent. Diets varied considerably among the different species, but copepods were usually the principal forage. The nonmigrating species living at great depths appeared to concentrate the organochlorines to the same extent as those which undergo diel vertical migration. The data suggests that dietary intake may be an important source of organochlorine contamination in mesopelagic fishes; it also implies a flow of energy out of the euphotic zone via oceanic food webs involving vertically migrating organisms.

76-0335. Khan, S. U.; Marriage, P. B.; Saidak, W. J. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ontario, Canada). **Residues of paraquat in an orchard soil.** *Can. J. Soil Sci.* 55(1): 73-75; 1975. (8 references)

Between 1963 and 1971, paraquat was applied yearly to a peach orchard established on Fox sandy loam soil. The paraquat (2.24 kg/ha) was applied with other herbicides such as linuron once in early June and was also applied alone in early June, July, and late August. All applications were done in three replicates. The soils were sampled at depths of 0-5 cm, 5-10 cm, and 10-15 cm after the last herbicide application in 1971. In addition, soil treated with paraquat alone was placed in perforated aluminum pie plates and oat seeds were planted in it; the shoots were studied 2 weeks after planting. Over the 9-yr period, 16 and 8% of the total paraquat applied accumulated in the top 15 cm of the soil treated with paraquat alone and paraquat plus other herbicides, respectively. There was essentially no change in the total residue concentrations in the soil over the 5-month sampling period. It appeared that some of the paraquat had penetrated to unsampled soil below 15 cm. Oat plants grown in the treated soil showed no signs of damage or any loss of moisture, salt, or water-soluble material. The data suggests that the residue levels of paraquat found in the orchard soil (2.92 ppm in the top 5 cm, 1 ppm in the 5-10-cm layer, and 0.3-0.5 ppm in the 10-15-cm layer) pose no danger to crops grown in the treated soil.

76-0336. Szokolay, A.; Grunt, J.; Uhnak, J.; Madaric, A. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **K otazke epidemiologckych studii zatazenia cloveka a jeho prostredia reziduami chlorovanych insekticidov. [On the question of epidemiological studies of the load of man and his environment by chlorinated insecticides residues.]** *Cesk. Hyg.* 19(6-7): 276-279; 1974. (8 references) (Czech)

A technique is presented for use in epidemiological studies. This technique should allow determination of the amounts of persistent substances in the environment. The technique rests on a system of records divided in two parts. The first part concerns the sampling of the soil, surface, drinking water, vegetable, and animal products and food ready for human consumption. The second part includes findings from sampling fatty tissue, liver, kidneys, and brain of man and records on the examination of human embryos or the uterus content. Concurrently a case history providing information on the living environment is extracted from each individual.

76-0337. Uhnak, J.; Szokolay, A.; Sackmauerova, M. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). Porovanie zatazenia obyvatel'stva reziduami chlorovanych insekticidov Zmliecneho tuku a celodennej stravy. **[A comparison of the population exposure to residues of chlorinated insecticides from milk fat and whole-day diet.** *Cesk. Hyg.* 19(6-7): 280-285; 1974. (19 references) (Czech)

A study was conducted over a period of years concerning the content of chlorinated insecticides such as BHC and DDT in milk products and in the daily diet. The study showed that the average residue content in the milk fat (in mg/kg) was: γ-BHC, 0.041; α + β + δ-BHC, 0.084; *p,p'*-DDT, 0.059; and *p,p'*-DDE, 0.082. The exposure level for humans based on the average consumption of these products, was calculated to be 0.0042 mg of BHC and 0.0037 mg DDT daily. The whole-day diet of students at two times of the year, February and September, was monitored. From this information the general daily intake of BHC was calculated to be in the amount of 0.053 mg and for DDT, 0.099 mg. These values are 15 and 3 times lower, respectively, than the ADI values reported by the World Health Organization.

76-0338. Ross, R. D.; Crosby, D. G. (Dep. Environ. Toxicol., Univ. California, Davis, CA). **The photooxidation of aldrin in water.** *Chemosphere* 4(5): 277-282; 1975. (30 references)

Aqueous aldrin (25 μ/l) was subjected to photolysis in closed flasks under summer sunlight or in a reactor, was allowed to stand for 3 days at ambient temperature in the dark with peroxyacetic acid generated in situ, or was reacted with chemically generated singlet molecular oxygen. In demineralized water, aldrin was stable in both the presence and absence of UV light at wavelengths above 300 nm. However, in the presence of two common photosensitizers, acetone and acetaldehyde, aldrin was photooxidized to dieldrin. Aldrin was also 25% epoxidized in the dark (within 36 hr) in the presence of dilute aqueous peracetic acid; the terminal breakdown product of peracetic acid, acetic acid, was detected at the conclusion of the experiment. When a mixture of aldrin solution and sterilized taro paddy water was irradiated or exposed to sunlight, 25% of the aldrin was converted to dieldrin in 36 hr; there was no reaction in the dark. The design of standardized models to predict the behavior of chemicals in natural waters should include provision for photochemically generated oxidants.

76-0339. Kotzias, D.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie CVI. Vorkommen von Xenobiotika im Sickerwasser von Muelldeponien. [Contributions to environmental chemistry, Part 106. Occurrence of contaminants in percolating water from waste disposal sites.]** *Chemosphere* 4(5): 301-306; 1975. (5 references) (German)

Percolating water and soil samples from three sanitary landfills in the Netherlands were analyzed for organic contaminants by a combined gas chromatographic-mass spectrometric method. Lindane was detected in some soil samples, while a few percolating water samples contained dichlorobenzonitrile (dichlobenil) in the 1-2 ppb range. Alkyl-substituted benzenes and phenols were also found, but could not be determined accurately by mass spectrometry.

76-0340. Morita, M.; Mimura, S.; Ohi, G.; Yagyu, H.; Nishizawa, T. (Tokyo Metropolitan Res. Lab. Public Health, Tokyo 160, Japan). **A systematic determination of chlorinated benzenes in human adipose tissue.** *Environ. Pollut.* 9(3): 175-179; 1975. (7 references)

A systematic search was undertaken for chlorinated benzenes in human adipose tissue collected in the Tokyo metropolitan area. The study showed that the highest peak in the fragmentogram was that of 1,4-dichlorobenzene, the second was hexachlorobenzene, and the last was 1,2,4,5-tetrachlorobenzene. Isomers below the concentration level of 0.010 μg/g fat were not detectable in this system. Gas chromatography, however, revealed a peak which may have been pentachlorobenzene, the residual level of which would be in the range 0.004 to 0.020 μg/g with the mean value of 0.009 μg/g fat. 1,4-Dichlorobenzene and hexachlorobenzene were detected not only in human adipose tissue but also in all coastal fish examined. 1,4-Dichlorobenzene has been widely used as a moth repellant with the major route for human contamination being the inspiration of ambient air. 1,2,4,5-Tetrachlorobenzene is said to occur among the metabolites of γ-BHC when houseflies are exposed to that compound. Hexachlorobenzene, in Japan, has been used mainly in the organic synthesis and as an additive for rubber products, and not as a fungicide, which is often a major use in other countries. Further study is needed to identify the source of contamination and the routes by which these compounds enter the human body.

76-0341. Mashiro, O.; Takahisa, H. (Tokyo Metropolitan Univ., Dep. Chem., Fac. Sci., Tokyo, Japan). **Alpha- and gamma-BHC in Tokyo rainwater (December 1968 to November 1969).** *Environ. Pollut.* 9(4): 283-288; 1975. (6 references)

A study was made of the concentration of BHC in rainwater collected in Tokyo, Japan. BHC accounts for about 90% of all organochlorine pesticides used in Japan. A total of 59 samples, collected on days when the precipitation was 2 mm or above, were taken between December 1968 and November 1969. The concentration of α was in the range of 45 to 930 ppt and γ-BHC was in the range of 29 to 398 ppt. On days when rain changed to snow, both rainwater and snow were collected and analyzed. The concentration of BHC was twice to 8 times as high in the rainwater than in the snow, perhaps because the rain had already removed the BHC from the atmosphere. The reason why more α- than γ-isomer was found may be that the α-isomer is the one more commonly used in Japan. The highest concentrations of BHC occurred during June, July, August, September, and October, which correlated with the period of highest usage of BHC. However, even though the concentrations of BHC obtained during the other months were low, BHC contamination of rainwater occurred during the entire year. From the results of this study it is concluded that a large amount of BHC sprayed in the atmosphere falls to the ground in a short time after spraying, mixed with the rainwater. The rest remains in the atmosphere for a long period and falls out gradually. Rainwater thus contaminated falls throughout the year even in urban areas such as Tokyo, indicating that contamination of the atmosphere by organochlorine pesticides occurs widely. No correlation could be found between the concentration of BHC in rainwater and the direction of the wind. Further experiments determined that a large portion of the BHC in rainwater was dissolved and/or absorbed onto some particles of less than 0.45 μm. It is estimated that the amount of BHC transported to the ground of Japan by rainwater is 170 tons/year. This amount of BHC is only 0.36% of the amount of BHC used in a year in Japan. It is expected that this contamination will now start to lessen, as BHC and other organochlorine pesticides are no longer used in Japan.

76-0342. Eberhardt, L. L. (Pacific Northwest Lab., Battelle Mem. Inst., Richland, WA 99352). **Some methodology for appraising contaminants in aquatic systems.** *J. Fish. Res. Board Can.* 32(10): 1852-1859; 1975. (39 references)

Kinetic models for uptake and retention of various contaminants by aquatic biota are recommended as a useful means of summarizing and intercomparing laboratory studies, and as essential tools in analyzing field data. Some simple models are fitted to laboratory data on the uptake and retention of DDT and dieldrin by fish. The well-known relation between metabolic rate and body size is used to appraise data and concentrations of DDT, PCBs, and mercury in fish taken from lakes and oceans. Evidence suggests that uptake and retention experiments performed on small fish give very different results from those expected on individuals important in sports or commercial fisheries. (Author abstract by permission)

76-0343. Bowes, G. W.; Jonkel, C. J. (California Water Resour. Chem. Soc., Div. Planning Res., Sacramento, CA 95814). **Presence and distribution of polychlorinated biphenyls (PCB) in arctic and subarctic marine food chains.** *J. Fish. Res. Board Can.* 32(11): 2111-2123; 1975. (29 references)

Polychlorinated biphenyls (PCB), man-made industrial chemicals, have been identified in tissues of polar bears (*Ursus maritimus*), ringed (*Phoca hispida*) and square flipper (*Erignathus barbatus*) seals, and Arctic char (*Salvelinus alpinus*) of the Canadian arctic and subarctic. All tissues from each species examined contained these compounds. PCB content in tissue, both absolute and relative to the concentration of DDT (p,p'-DDE + p,p'-DDD + p,p'-DDT), generally increased from seals to adult polar bears to polar bear cubs and young. Polar bear milk contained high concentrations of PCB and is the most probable source of the high concentrations in polar bear cubs. Chromatograms revealed a greater accumulation of higher chlorinated PCB isomers in polar bears than in seals, their main food. Residue data suggests that polar bear subpopluations in the eastern Canadian arctic and subarctic have been exposed to higher levels of PCB and DDT than western subpopulations. (Author abstract by permission)

76-0344. Taruski, A. G.; Olney, C. E.; Winn, H. E. (Grad. Sch. Oceanogr., Univ. Rhode Island, Kingston, RI 02881). **Chlorinated hydrocarbons in cetaceans.** *J. Fish. Res. Board. Can.* 32(11): 2205-2209; 1975. (26 references)

DDT, PCBs, chlordane, and dieldrin levels were measured in blubber of 18 cetaceans, including humpback, sperm, dense-beaked, Atlantic, and Pacific pilot whales, and five species of dolphins. All had significant residue levels, ranging from 1.1 to 1023 ppm ΣDDT (wet weight basis), and 0.7-147 ppm PCBs. These levels are high enough to justify efforts to reduce PCB contamination of the oceans and a continued ban on widespread use of DDT. (Author abstract by permission)

76-0345. Nath, G.; Jat, N. R.; Srivastava, B. P. (Dep. Entomol., Univ. Udaipur, Rajasthan, India). **Effect of washing, cooking, and dehydration on the removal of some insecticides from okra (*Abelmoschus esculentus* Moench).** *J. Food Sci. Technol. (Mysore)* 12(3): 127-131; 1975. (18 references)

As residues of insecticides on okra may cause health hazards to consumers, the effectiveness was studied of various procedures for the removal of the residues of malathion, carbaryl, and endosulfan. Two treatment dosages 0.05% and 0.1%, were used, for malathion. For the respective malathion dose levels, 89% and 79% of

the residues were removed by washing, 87% and 58% by open-cooking, 76% and 58% by steam-cooking, and 92% due to dehydration. Thus, all these processes removed malathion residue to below the tolerance limit of 3 ppm. For carbaryl experiments the dose levels were 0.25% and 0.5%. Washing reduced the residue by 66% and 70%, open cooking by 42% and 25%, steam cooking by 82% and 49%, and dehydration by 79% and 77% respectively for the two dose levels applied. Thus, in the case of the lower treatment dosage, all the processes except open cooking reduced the residue below the tolerance limit of 10 ppm. The dosages of endosulfan applied were 0.1% and 0.2%. Washing removed 35% and 49%, open cooking removed 26% and 24%, steam cooking removed 26.93% and 31.12%, and dehydration removed 58% and 57% of the dosages applied, respectively. Thus, none of these processes were able to reduce the residues from either of the treatment dosages used to levels below the prescribed tolerance limit of 2 ppm.

76-0346. Rhodes, D. N.; Patterson, R. L. S.; Puckey, D. J.; Heuser, S. G.; Wainman, H. E.; Chakrabarti, B.; Allan, E. N. W. (ARC Meat Res. Inst., Langford, Bristol, England) **Exposure of meat to methyl bromide during refrigerated-store pest control; residues in beef and lamb and effect on quality.** *J. Sci. Food. Agric.* 26(9): 1375-1380; 1975. (9 references)

Methyl bromide was considered for use as an eradicant for rats infesting the wall insulation of a commercial frozen meat store after unsatisfactory results had been obtained with carbon dioxide. Trial fumigations were conducted to determine the penetration and distribution of methyl bromide vapor under the conditions of low temperature and exposed fat layer on meat carcasses, which were expected to enhance uptake and retention of methyl bromide. Results of the study indicated that penetration into the wrapped insulation material was virtually unimpeded. In taste tests no significant difference in flavor of fat or lean was noticed and no difference in odor either, for the grilled lamb chops. The results of taste tests on roast beef showed no significant difference in flavor or odor of fat or lean when the beef had undergone treatment at 1 and 3 times the level considered necessary for rodent control. However, meat which was treated at ten times this level was unacceptable on counts of both flavor and odor. Traces of residual methyl bromide were detected by gas chromatography-mass spectrometry in fats after periods of up to 3 months in refrigerated storage.

76-0347. Wells, J. M.; Bennett, A. H. (U.S. Dep. Agric., Southeast. Fruit Tree Nut Res. Station, Byron, GA 31008). **Postharvest decay, weight loss, and fungicide residues on peaches hydro- or hydraircooled before or after waxing.** *Plant Dis. Rep.* 59(11): 931-935; 1975. (9 references)

The average percent decay on peaches treated with 100 ppm chlorine, 900 ppm 2,6-dichloro-4-nitroaniline (DCNA), or 900 ppm DCNA plus 300 ppm benomyl in a hydrocooler was the same as that on peaches similarly treated in a hydraircooler. Hydrocooling with 900 ppm DCNA plus 300 ppm benomyl resulted in less decay (8.0%) than was observed with 100 ppm chlorine (25.0% decay). Peaches brushed with fungicide-impregnated wax concentrates showed a 1.6-6.8% decay. Prior hydro- or hydraircooling treatment had no significant effect on decay development on the waxed fruit. Hydro- or hydraircooling of peaches brushed with a water-insoluble, oil-base concentrate containing 5000 ppm DCNA plus 2500 ppm benomyl or sprayed with a 10X dilution of a water-soluble paraffin-base concentrate containing 1800 ppm DCNA plus 900 ppm benomyl resulted in the loss of a portion of the fungicide residues. The losses were significant on the peaches which were hydrocooled following the paraffin-wax treatment. Waxed peaches hydraircooled in a nonrecirculating, fresh-water system lot significantly less DCNA residues and less fresh weight than waxed peaches hydrocooled in a recirculating system.

76-0348. Musty, P. R.; Nickless, G. (Dep. Inorg. Chem., Univ. Bristol, Bristol, England). **Foams as extractants for organochlorine insecticides, polychlorobiphenyls and heavy metals from water.** *Proc. Anal. Div. Chem. Soc.* 12(11): 295-296; 1975.

The advisability was investigated of using porous polyurethane foams for the recovery of organochlorine insecticides and polychlorobiphenyls from water. Two foam plugs, each 8.0 cm long and 2.2 cm in diameter, were packed into a glass column 2.0 cm in diameter. The water flow rate was 100 ml/min. The following statistics give the percent recoveries for various organochlorines by this technique: α-BHC, 91%; lindane, 91%; β-BHC, 100%; aldrin, 93%; *p,p'*-DDE, 106%; dieldrin, 100%; endrin, 108%; *o,p'*-DDT, 103%; *p,p'*-DDD, 102%; *p,p'*-DDT, 109%; heptachlor, 93%; endosulfan I, 95%; endosulfan II, 94%; aroclor 1242, 87%; aroclor 1248, 99%; aroclor 1254, 84%; and aroclor 1260, 40%. There are several properties which make polyurethane foams desirable extractants for organochlorines, including the fact that very large volumes can be processed, the effects of pH values of the spiked water between 5 and 9 were relatively slight; high water flow rates can be achieved; complete recoveries, with the exception of aroclor 1260, can be obtained; the material has a very high capacity for organochlorines; foams can be repeatedly used. The results of this study demonstrate the effectiveness of polyurethane foams for recovering organochlorines from real, environmental water samples. The use of alternative chelating agents such as quinolin-8-ol or sodium diethyldithiocarbamate may produce a superior extractant for heavy metal ions.

76-0349. Mosey, D. (Author address not given). **Measurement and prediction—up in the air over pesticide accountancy.** *Sci. Dimension* 7(4): 11-14; 1975.

When pesticides are applied by airborne spray units, a wide spectrum of droplet size may result. While the larger droplets fall fairly rapidly and impact on target, smaller droplets can remain airborne in the form of an aerosol cloud, drifting for considerable distances. A second area of uncertainty about the fate of these chemicals thus applied arises through their loss by evaporation from the target itself, the resultant vapor cloud drifting off downwind. A means of monitoring and predicting the movements of these chemicals has been developed. The system for such measurements uses a gas chromatograph into which air samples can be introduced directly, thus providing the capacity for fairly rapid localized sampling. The chromatograph was used in test flights and it was confirmed that the instrument was not affected by vibration or aircraft motion. In trials conducted over the Saskatchewan wheat belt, a total of 47 air samples were taken. Twenty-three of the samples showed evidence of pesticide concentrations corresponding to levels of a few parts per billion. Herbicide vapor was detected as high of 3000 feet (900 m) during a late, sunny afternoon flight, evidently carried aloft by convective turbulence. In an additional test made over a forest area sprayed with fenitrothion and phosphamidon, two studies were performed. In one about 30 seconds after the spraying plane passed, the sampling plane passed, and the second was done about 1 hr later. On the first testings it appeared that the pesticide concentrations were very high and uneven. After the second tests the pesticides were shown to be low and uniform over the sprayed area.

76-0350. Yates, W. E.; Akesson, N. B.; Cowden, R. E. (Agric. Eng. Dep., Univ. California, Davis, CA). **Criteria for minimizing drift residues on crops downwind from aerial applications.** *Trans. ASAE 17(4): 627-232; 1974. (5 references)*

The results of 11 chemical drift studies performed during 1966 were analyzed. The effects of micrometerological conditions, atomization, and oil content on drift residue characteristics were investigated. To minimize drift residues, applicators should avoid spraying during very stable atmospheric conditions generally found during strong temperature inversions accompanied by low wind velocities. High wind velocities generally produce nearly neutral stability and reduce residue concentrations by dilution over a greater distance. Applications with D6-45 nozzles directed downward produced residues 1-2 mi downwind that were 5.5 times greater than those produced by a larger drop size spectrum from D6-46 nozzles directed backward. A 100% oil application produced 4 times as much residue as a 2.8% O/W emulsion from 500-1000 ft downwind and about equal residues at 4600 ft. Estimated pesticide residues at various distances downwind under a variety of simulated field conditions are presented. These values can be used as a basic guide to establish safe operating conditions for specific chemical tolerances on nearby crops.

76-0351. Goering, C. E.; Butler, B. J. (Agric. Eng. Dep., Univ. Missouri, Columbia, MO). **Paired field studies of herbicide drift.** *Trans. ASAE* 18(11): 27-34; 1975. (7 references)

Field tests of herbicide drift from a ground rig sprayer were conducted to determine the effectiveness of a new polymer (Nalco-Trol) and of certain application techniques in reducing drift and to obtain data for the development of a drift prediction model. A dual sprayer was used to permit the simultaneous spraying of two formulations under different nozzle pressures and a dual tracer technique was used to permit quantitative tracing of material from both tanks. Because the fluorescent tracer dyes degraded in sunlight, the results had to be corrected for dye degradation. Drift deposits in relation to downwind distance could be fitted with a curve having only slight curvature on log-log paper. Drift deposits were reduced by using the Nalco-Trol spray thickener, lowering the nozzle height, reducing the nozzle pressure from 276 to 172 kPa, and low temperature plus high relative humidity. Increased air turbulence produced greater spray loss but less downwind drift deposits and increased horizontal wind speed produced greater spray loss with either greater or smaller drift deposits. The Nalco-Trol thickener was also effective in reducing the amount of spray loss by increasing deposits within the swath.

76-0352. Nitsche, W. (8500 Nuernberg, West Germany). **Umweltprobleme unter besonderer Beruecksichtigung des technisch-hygienischen Umweltschutzes. [Environmental problems with particular reference to industrial hygienic environmental protection.]** *Z. Allgemeinmed.* 51(4): 647-677; 1975. (103 references) (German)

General problems of environmental pollution and contamination in air, water, soil, food, and living organisms are reviewed. Pesticides, especially DDT and other organochlorine preparations, represent soil and water contamination hazards. The average DDT levels in rivers and lakes range from 0.01 to 0.1 μg/liter. Man is exposed to pesticides occupationally and through contaminated food. While the acute poisoning hazards with organochlorine pesticides are negligible, and there is no real danger of poisoning with pesticide residues in foodstuffs in West Germany, such accumulated residues may become hazardous in pathological states, such as infectious diseases and starvation. Over 70% of milk products tested in the USA contained pesticide residues, and 99.3% of all residues were those of organochlorine pesticides. The residues in meat and dairy products are most probably due to contaminated feed. Human milk analyses in West Germany revealed 1.1 ppm of DDT, 2.7 ppm of DDE, 0.54 ppm of BHC, 5.3 ppm of hexachlorobenzene, and 3.5 ppm of PCBs. Organophosphorus pesticides are readily degradable and consequently cause no residue problems. The mercury intake in West Germany is well below the acceptable limit. A maximum allowable residue level of 0.4-1 μg/kg is expected to be imposed on mercury

in fish. The use of DDT has been banned in West Germany. To abate food contamination with pesticides, biological pest control methods should be used on a larger scale.

76-0353. Franzke, C.; Eckloff, . (Sektion Chemie, Bereich Lebensmittelchemie, 104 Berlin, DDR). **Zur Kadmiumkontamination in Lebensmitteln. [Cadmium contamination of foodstuffs.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 21(10): 761-766; 1975. (46 references) (German)

Studies and observations are reviewed on the sources, toxic effects, and residues of cadmium in the environment and foods. Certain cadmium salts, such as that of *o*-propyldithiocarboxylic acid, are used as fungicides. Rapid uptake and distribution of cadmium in plants from the soil was observed. The migration from soil into plants and fruit is more rapid than that of mercury or lead. Cadmium ions inhibit enzymes containing SH groups, and interfere with the oxidation of SH groups to disulfide. Cadmium is accumulated mainly in the liver. The rate of resorption after oral intake amounts to 5%. Chronic poisoning primarily causes liver and kidney damage. The ADI has been set at 57-71 μg/day.

76-0354. Okawa, M. T.; Bodnar, A. (Ferry Morse Seed Co., Mountain View, CA). **Health hazard evaluation/toxicity determination.** *Nat. Tech. Inform. Serv.* PB-229 644, 1973, 21 p.

In response to a request received from a representative of employees per the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, the National Institute for Occupational Safety and Health (NIOSH) conducted a health hazard survey to evaluate exposure to airborne dusts containing seed-treating chemicals or pesticides at the Ferry Morse Seed Company, Mountain View, California. It was determined that airborne dust levels of thiram, captan, aldrin, dieldrin, gamma-benzene hexachloride, and beta-benzene hexachloride are not toxic at the concentrations measured during this evaluation. This evaluation was based on environmental levels of these compounds, employee interviews, biological samples, and available literature on the toxicities of these chemicals. Recommendations have been suggested to management to obviate potential hazards to 80 affected employees. (Author abstract by permission)

76-0355. Hamelink, J. L.; Waybrant, R. C. (Water Resour. Res. Cent., Purdue Univ., West Lafayette, IN 47907). **Factors controlling the dynamics of non-ionic synthetic organic chemicals in aquatic environments.** *Nat. Tech. Inform Serv.* PB-232 267, 1973, 68 p. (5 references)

The distribution and persistence of DDE and lindane added to the epilimnion of a thermally stratified, ultra-oligotrophic flooded limestone quarry were studied. The quarry was treated with a single sub-lethal dose of each compound at a concentration of 200 pptr in the epilimnion or 50 pptr based on the entire water mass. An adjacent quarry was used as a control. Water, bottom sediments, limestone rock slabs, zooplankton, and fish were periodically analyzed. Dissolved oxygen and temperature profiles were also monitored. Results indicated that persistence of the pesticides may be primarily controlled by adsorption onto suspended particles. DDE was lost from the water approximately 15 times as fast as lindane. DDE was biologically magnified to a greater extent than lindane, and the DDE accumulated and retained by the invertebrates was closely correlated with the DDE concentration in the water. An equilibrium with lindane between fish and water was reached about 12 times faster than that with DDE. The results include the development of a simple two-compartment partition model that may be useful in predicting the distribution and persistence of a variety of nonionic synthetic organic compounds. (Author abstract by permission)

76-0356. Dornbush, J. N.; Andersen, J. R.; Harms, L. L. (Civil Eng. Dep., South Dakota State Univ., Brookings, SD 57006). **Quantification of pollutants in agricultural runoff.** *Nat. Tech. Inform. Serv.* PB-233 134, 1974, 149 p. (73 references)

Surface runoff from snowmelt and rainfall in eastern South Dakota was measured during a three year period. The size of the research sites ranged from 7.18 to 18.69 acres, and all sites had crops of corn, oats, pasture or hayland. Composite samples of the runoff were used for various chemical, physical and biological determinations. Runoff samples from 108 snowmelt events and 36 rainfall events were collected. Equipment fabrication and installation resulted in some incomplete data for the initial year, but successful monitoring of each runoff event was accomplished thereafter. Sediment losses were considerably lower than anticipated. Pesticide concentrations were low in both water and sediment samples, and were usually less than the analytical test limits. Coliform and fecal levels were consistently greater than accepted surface water quality criteria. Most of the nutrients were found to be soluble and/or associated with snowmelt runoff. (Author abstract by permission)

76-0357. Young, A. L. (Air Force Armament Lab., Eglin Air Force Base, FL 32542). **Ecological studies on a herbicide-equipment test area (TA C-52A), Eglin AFB Reservation, Florida).** *Nat. Tech. Inform. Serv.* AD-780 517, 1974, 140 p. (31 references)

This report attempts to answer the major questions concerned with the ecological consequences of applying massive quantities of herbicides (346,117 pounds), via repetitive applications, over a period of eight years, 1962 - 1970, to an area of approximately one square mile. Moreover, the report documents the persistence, degradation, and/or disappearance of the herbicides from the Test Area's soils and drainage waters and their subsequent effects (direct or indirect) upon the vegetative, faunal, and

microbial communities. The active ingredients of the four military herbicides (Orange, Purple, White, and Blue) sprayed on Test Area C-52A were 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4-amino-3,5,6-trichloropicolinic acid (picloram), and dimethylarsinic acid (cacodylic acid). It is probable that the 2,4,5-T herbicide contained the highly teratogenic contaminant 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Significant herbicide residues were found in 1969. However, analysis of soil cores in 1971 indicated residues of 2,4-D, 2,4,5-T, picloram, and arsenic to be in the parts per billion range; no TCDD was found at this detection limit. Soil samples collected in June and October 1973 showed TCDD (or a TCDD-like chemical) levels ranging from less than 10 parts per trillion (ppt) to 710 ppt. Direct effects of the herbicides on the vegetative community were temporary. With the disappearance of residue, vegetative succession was initiated. By 1973, the majority of the test area could not be distinguished from control sites. Analysis of sample animal populations indicated that no histological or gross abnormalities were present in adults or their progeny. (Author abstract by permission)

76-0358. Zepp, R. G.; Wolfe, N. L.; Gordon, J. A.; Bauchman, G. L. (Environ. Res. Lab., U.S. Environ. Protect. Ag., Athens, GA 230601). **Dynamics of 2,4-D esters in surface waters. Hydrolysis, photolysis, and vaporization.** *Environ. Sci. Technol.* 9(13): 1144-1150; 1975. (40 references)

The chemical hydrolysis, photolysis, and volatilization of several commonly used 2,4-D esters were studied. The hydrolysis rates are strongly dependent upon ester structure; esters possessing ether linkages near the carboxyl group generally hydrolyze more rapidly than hydrocarbon chain esters. The rapid hydrolysis is often the major pathway for transformation of 2,4-D esters in natural waters. Photoproducts of 2,4-D esters are monochlorophenoxyacetic acid esters in hydrocarbon media and in ester-water emulsions; in aqueous solutions, chlorohydroxyphenoxyacetic acid esters and 2,4-dichlorophenol are formed. Direct photolysis in water is a slow process; the minimum photolysis half-life of the butoxyethyl ester under September sunlight is about 14 days in the southern United States. The photolysis rate is pH-independent, but it depends strongly upon time of day, season, and latitude. Calculations based upon solubilities and vapor pressures of 2,4-D esters indicate that volatilization may be a significant mechanism in the loss of hydrocarbon chain esters from environmental waters. (Author abstract reprinted by permission of the American Chemical Society.)

76-0359. Bruce, R. R.; Harper, L. A.; Leonard, R. A.; Snyder, W. M.; Thomas, A. W. (South. Reg., Agr. Res. Serv., Watkinsville, GA 30677). **A model for runoff of pesticides from small upland watersheds.** *J. Environ. Qual.* 4(4): 541-548; 1975. (18 references)

A mathematical model has been developed describing the rate and quantity of runoff water from separate rainfall events on a watershed and the rate and quantity of sediment and pesticides transported. The runoff water is calculated by convolving an area-characteristic and variable state function to produce a variable response function which is then convolved with a computed effective rain. Rill and interrill erosion are conceptually distinguished which allows similar partitioning of associated pesticides. The sediment contribution from interrill erosion is a function of rainfall intensity and soil susceptibility to erosion. The rill erosion is a function of water runoff and the rate of change of water of runoff. The concentrations of pesticides in the runoff are functions of the amount of runoff, the sediment concentrations derived from rill and interrill erosion, and the pesticide concentrations in the respective runoff-erosion zones. Experience with the model in simulating the water, sediment, and pesticide runoff from an upland Piedmont plain watershed for four summer storms is related. Excellent simulations were obtained.

76-0360. Stringer, A.; Pickard, J.; Lyons, C. H. (Long Ashton Res. Stn., Univ. Bristol, England). **Accumulation and distribution of *p,p'*-DDT and related compounds in an apple orchard. II. Residues in trees and herbage.** *Pestic. Sci.* 6(3): 223-232; 1975. (15 references)

DDT residues in or on the roots and leaves of the herbage and the roots, bark, leaves and fruit of the trees are given for an apple orchard sprayed annually (1953-1969). The distribution of DDT in both the grass and the grass roots was in circular areas of residues, with maximum values at each trunk and decreasing radially to each alley. Of the spray applied at the green cluster stage 80% was deposited on the grass sward and very little, if any, directly on the soil surface. The *p,p'*-DDT content of the grass fell rapidly with successive mowings (from which the cuttings remained in situ) from 400 μg/g at spraying to 2 μg/g after nine months; 33 g/ha *p,p'*-DDT was found in the herbage roots (0.87% of the total residues in the soil). The residues in the bark (87.5 g/ha) were much lower than expected after 13 years spray application. There were increased amounts of *p,p'*-DDE, *p,p'*-TDE and *p,p'*-TDEE relative to *p,p'*-DDT, indicating some breakdown on the bark, but the chief losses were attributed to volatilization and to removal by wind and rain. The residue content of root bark varied from 3 μg/g near the emerging trunk to 0.05 μg/g at a depth of 90 cm. The *p,p'*-DDT content of leaves at leaf fall rose from <1 ng/g after a single spring spray to 8.33 μg/g following an additional spray in late June. There was a large loss of DDT from the canopy between the June spray and leaf fall (440-480 g/ha down to 25 g/ha), attributed to volatilization. The amount of *p,p'*-DDT on the fruit, after a single spray, was 3 ng/g fresh weight (80.9 mg/ha out of a total of 1.0-1.5 kg/ha used). (Author abstract by permission)

76-0361. Suett, D. L. (Natl. Veg. Res. Stn., Wellesbourne, Warwick, England). **Persistence and degradation**

of chlorfenvinphos, chlormephos, disulfoton, phorate, and pirimiphos-ethyl following spring and late-summer soil application. *Pestic. Sci.* 6(4): 385-393; 1975. (21 references)

Granular formulations of chlorfenvinphos, chlormephos, disulfoton, phorate, and pirimiphos-ethyl were broadcast at 2 kg a.i./ha and incorporated to 100 mm into a sandy-loam soil either in May or in September 1971. The relative persistence of their residues, including insecticidally active oxidation products, after both application dates was disulfoton > chlorfenvinphos > phorate > pirimiphos-ethyl > chlormephos. When applied in September all the insecticides persisted for longer than when applied in May. Degradation was slower during the winter while the mean soil temperature at 100 mm depth remained below 6 to 7°C. Rising soil temperature in the following spring rapidly increased the rates of degradation of chlorfenvinphos, chlormephos and pirimiphos-ethyl residues but not of disulfoton- and phorate-derived residues, predominantly the parent sulfones, which had been leached deeper. Ten months after the September application, half the total residues derived from disulfoton and phorate were found below the initial incorporation depth, whereas the other insecticides showed relatively little downward movement. It was concluded that late summer/early autumn applications for carrot fly control would leave appreciable residues of some insecticides in the soil at the beginning of the next growing season which may contribute to the terminal residues in crops. These would be minimized if moderately persistent compounds were used or if doses of persistent ones were substantially reduced. (Author abstract by permission)

76-0362. Jacob, T. A.; Carlin, J. R.; Walker, R. W.; Wolf, F. J.; VanDenHeuvel, A. J. A. (Merck Sharp and Dohme Res. Lab., Rahway, NJ 07065). **Photolysis of thiabendazole.** *J. Agric. Food Chem.* 23(4): 704-709; 1975. (10 references)

Thiabendazole labeled with carbon-14 has been employed to study the degradation of this fungicide on sugar beet leaves. Only unchanged thiabendazole was recovered from plants grown in artificial light, whereas with plants grown in sunlight only 78% of the recovered radioactivity was identified as starting compound. As the degradation appeared to arise from photolysis and not plant-induced metabolism, experiments were carried out by exposing thin films of thiabendazole on glass plates to sunlight and by irradiating aqueous methanolic solutions of thiabendazole with strong ultraviolet light. Benzimidazole and benzimidazole-2-carboxamide were shown by a combination of radiochemical, chromatographic, and spectrometric techniques to be produced by all three photolytic systems. (Author abstract reprinted by permission of the American Chemical Society)

76-0363. Koshy, K. T.; Friedman, A. R.; VanDerSlik, A. L.; Graber, D. R. (The Upjohn Co., Agric. Div., Kalamazoo, MI 49001). **Photolysis of benzoic acid 2-(2,4,6-trichlorophenyl) hydrazide.** *J. Agric. Food Chem.* 23(6): 1084-1088; 1975. (18 references)

The photolysis of benzoic acid 2-(2,4,6-trichlorophenyl) hydrazide was studied in the solid state as a thin film on 170-230 mesh glass beads under a 3000-Angstrom light source without and with a filter that absorbed radiation below 2900 Angstrom. Both ^{14}C-labeled and unlabeled material was used. Under the experimental conditions the photolytic half-lives were 12 and 16 hr, respectively. Eight photolysis products were identified by TLC, GLC, and GLC-MS by comparison to known standards. The major photolysis products were benzoic acid 2-(2,4-dichlorophenyl) hydrazide and 2,4,6-trichlorobenzophenone. Others were 2,4,6-trichlorobenzanilide, 2,4-dichlorobenzanilide, 2,6-dichlorobenzanilide, 2,4-dichlorobenzophenone, 1,2 - dibenzoyl-1-(2,4,6-trichlorophenyl) hydrazine, and 1,2-dibenzoyl-1- (2,4-dichlorophenyl) hydrazine. Benzene unextractable radioactivity accumulated on the beads to 13% after 36 hr of irradiation. There was 11% unaccountables at this time, probably due to volatile products. (Author abstract reprinted by permission of the American Chemical Society)

76-0364. Freeman, H. P.; Taylor, A. W.; Edwards, W. M. (Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Heptachlor and dieldrin disappearance from a field soil measured by annual residue determinations.** *J. Agric. Food Chem.* 23(6): 1101-1105; 1975. (14 references)

In 1969 heptachlor was incorporated to 7.5 cm depth in an experimental field. Over 4.5 years the disappearance rate followed first-order reaction kinetics according to the equation $\log H = 0.063 - 0.33T$, where H is in parts per million and T in years, giving a half-life of 0.91 year. Heptachlor epoxide and hydroxychlordene were identified as degradation products. In a similar experiment with dieldrin, begun in 1966, the disappearance followed the equation $D = 2.72 - 0.20 (\pm 0.09)T$, where the upper and lower values of the regression coefficient are the 80% confidence limits; the equation indicates a 95% disappearance time of 13 years. No dieldrin degradation products were identified. The results show that in experiments to measure persistence in the field, data must be obtained over the whole life of the pesticide. Sampling methods must permit determination of the variability inherent in data obtained in experiments using regular farm practices. (Author abstract reprinted by permission of the American Chemical Society)

76-0365. Glass, B. L. (Agr. Chem. Mgmt. Lab., U.S. Dep. Agric., Beltsville, MD 20705). **Photosensitization and luminescence of picloram.** *J. Agric. Food Chem.* 23(6): 1109-1112; 1975. (13 references)

The photosensitization of picloram was studied with known triplet-energy sensitizers. Benzophenone and benzoate increased the rate of photodecomposition of picloram by factors of about 3 and 2,

respectively, upon photolysis (313 nm) in aqueous solution (pH 9.3). The quantum yields for the disappearance of picloram (aerated) with 254- and 313-nm light were 0.037 and 0.04, respectively. Photophorescence emission of picloram in EPA-glass at 77° K occurred at 450 nm with a radiative lifetime of 40 msec for the free acid and 32 msec for the methyl ester, thus indicating an n,π^* triplet state. Fluorescence emission was quenched in weakly acidic, neutral, and basic solutions, but emitted strongly at 425 nm in aqueous sulfuric acid solutions at pH < 1.16. The conclusion drawn from these results is that photodecomposition of picloram takes place from the excited triplet state. (Author abstract reprinted by permission of the American Chemical Society)

76-0366. Ping, C. L.; Cheng, H. H.; McNeal, B. L. (Department of Agronomy and Soil Science, Washington State Univ., Pullman, WA 99163). **Variations in picloram leaching patterns for several soils.** *Soil Sci. Soc. Amer. Proc.* 39(3): 470-473; 1975.

Laboratory studies of picloram (4-amino-3,5,6-trichloropicolinic acid) leaching under saturated conditions were conducted for four soils. Leaching patterns could be related to variations in soil texture and pore uniformity for three soils from arid and semiarid regions. Diffusion from conducting pores into adjacent micropores appeared to be the most plausible explanation of leaching patterns obtained for an oxisol of volcanic origin from Hawaii. Evidence supporting the presence of the postulated micropore structure in this tropical soil was obtained from constancy in flow rate, from scanning electron micrographs, and from picloram recovery at a reduced leaching rate. (Author abstract by permission)

76-0367. Yaron, B. (Agr. Res. Organ., Volcani Cent., Bet Dagan, Israel). **Chemical conversion of parathion on soil surfaces.** *Soil Sci. Soc. Amer. Proc.* 39(4): 639-643; 1975. (19 references)

Chemical conversion of parathion was studied on a range of sterile soils widely different in organic matter content and clay mineralogy. After 130 days' incubation at room temperature, conversion ranged between 3-23% for air-dried samples and was < 10% for moist ones in all the soils studied. The conversion was found to proceed via hydrolysis of the phosphate ester bond. A conversion mechanism is proposed. The conversion was affected by soil constituents like clay and organic matter—the rate decreasing in the order: kaolinite > montmorillonite > organic matter, this being inversely related to the adsorption affinity of these materials for parathion. This phenomenon is explained by assuming that surface catalysis of parathion occurs at specific active sites only. For almost all the soils studied, the presence of water apparently blocked the active sites required for parathion decomposition, indicating that the soils' catalytic activity is moisture dependent. (Author abstract by permission)

76-0368. Goswami, K. P.; Green, R. E. (Dep. Agron. Soil Sci., Univ. Hawaii, Honolulu, HI 96822). **Microbial degradation of ametryn in Hawaiian Torrox and Hydrandept surface soils.** *Soil Sci. Soc. Amer. Proc.* 39(4): 669-673; 1975. (27 references)

Degradation of ring-^{14}C ametryn in autoclaved and inoculated surface soils with added C and N sources was measured for 60 days in a ^{14}C balance study. The study involved periodic analysis for total methanol-extractable ^{14}C, ^{14}C-polar products separated from the methanol extract by liquid-liquid partitioning with chloroform, $^{14}CO_2$ evolution, and ^{14}C-nonextractable residue by combustion. The results confirm that unlike the chemical breakdown of chloro-*s*-triazines, ametryn degradation in soil is predominantly a microbiological process which proceeds mainly through the initial *N*-dealkylation pathway with some simultaneous formation of hydroxyatrazine. Gas chromatographic analysis showed partitioning of two possible *N*-dealkylated products of ametryn metabolism into the aqueous phase of the chloroform/aqueous-methanol system. Less than 7% of the applied ametryn was lost in autoclaved soils, but ametryn was rapidly degraded in inoculated soils. Ametryn disappearance was much faster in the Hilo soil (Typic Hydrandept) with 8.7% remaining at 60 days than in the Molokai soil (Typic Torrox) with 63.7% remaining. The extremely high surface area and high organic matter content of the Hydrandept surface soil were considered conducive to higher microbial activity in this soil. The major fraction of ^{14}C-degradation products was recovered in polar compounds with a lesser quantity residing in a nonextractable fraction; less than 0.2% was evolved as $^{14}CO_2$. Evolution of $^{14}CO_2$ at a given time was not governed either by the quantity of parent ametryn remaining nor by the concentration of polar products. (Author abstract by permission)

76-0369. Suzuki, Y.; Sugaya, H.; Sasaki, S. (Inst. Rural Med., Hiraga Gen. Hosp., Akita, Japan). [**Amount of organochlorine pesticide residues in the human body and organochlorine content of human blood.**] *Akita-Ken Noson Igakkai Zasshi (J. Assoc. Rural Med., Akita Pref.)* 22(1): 41-44; 1975. (Japanese)

Organochlorine pesticide residues, α- and β-BHC, DDE, *o,p'*- and *p,p'*-DDT, and dieldrin, were determined in the blood of farmers who had applied such pesticides for many years and of young farmers in 1972, 1973, and 1974 in Iwate Prefecture. In 1972, amounts of residues were generally larger in the former group than in the latter: β-BHC 0.0337 vs. 0.0115 ppm and DDE 0.0484 vs. 0.0115 ppm. In 1973, no difference was seen between the two groups: e.g., β-BHC was 0.0138 vs. 0.0119 ppm and *p,p'*-DDT found was 0.0028 vs. 0.0014 ppm. The amount decreased during 1973 and increased again in 1974; β-BHC was 0.0337, 0.0138, and 0.0320 ppm, respectively, in 1972, 1973, and 1974. Of farmers who had applied pesticides continuously throughout three years, some had increased concentrations of pesticide residues in blood, some had reduced concentrations, and some had decreasing and then increasing concentrations.

76-0370. Hirano, C.; Katada, K. (Sch. Agric. Chem., Fac. Agric., Kochi Univ., Kochi, Japan). [**State of pollution of small rivers in agricultural areas by organochlorine insecticides. A case in the Koso River in Kochi Prefecture 1973.**] *Bochu Kagaku (Sci. Pest Contr.)* 40(4): 132-137; 1975. (13 references) (Japanese)

Samples of water, river bottom soil, and aquatic plants were collected from the lower, middle, and mouth regions of the Koso River, an important irrigation stream in one of the plains of Kochi Prefecture. Pollution of these areas by organochlorine insecticides and related compounds were investigated. The only confirmed compounds in river water and sea surface water were BHC isomers: 10-70 ppt of α-, 10-30 ppt of β-, 5-40 ppt of γ-, and 0-10 ppt of δ-BHC. The bottom soil contained 0.5-7.4 ppb of α-, and 0.2-2 ppb of γ-BHC. Aquatic plants contained 0.6-2.2 ppb of α- and 0.5-3 ppb of γ-BHC, and β-BHC and dieldrin were found frequently. The water pollution has decreased since organochlorine insecticides are no longer broadly applied.

76-0371. Nagasaki Prefectural Office (Nagasaki, Japan). **Environmental pollution by pesticide residues, Chap. 5: The present state of problems due to environmental pollution by pesticide residues.** *Nagasaki-Ken Kankyo Hakusho (Environ. White Paper, Nagasaki Pref.)* 156-165; 1974. (Japanese)

Highly toxic pesticides such as parathion and TEPP, organomercury pesticides, and organochlorine insecticides such as BHC and DDT have been banned, and the use of the highly fish-toxic pentachlorophenol has been strictly limited. Their long term previous application, however, has caused environmental pollution. In residue determinations in 1974, BHC and DDT were not detected in brown rice, potato, eggplant, pepper, lettuce, tomato, cabbage, strawberry, and other vegetables. Residues of BHC isomers in cow's milk were 0.004, 0.013, 0.001, and 0.000 ppm, respectively, for α-, β-, γ-, and δ-BHC. Residues of dieldrin in soil could be dissipated by deep plowing.

76-0372. Nagasaki Prefectual Office. (Nagasaki, Japan). [**Environmental pollution by pesticides (Chapter 8) Part 2. Countermeasures for pesticidal pollution.**] *Nagasaki-Ken Kankyo Hakusho (Environ. White Paper, Nagasaki Pref.)* 168-176; 1973. (Japanese)

The present state of pesticide residues, especially organomercurial and organochlorine pesticides, was described in agricultural crops, products of animal husbandry, mothers' milk, and soil. BHC was detected in brown rice (0.063-0.032 ppm), cucumber (0.013-0), tea leaf (0.013-0.009), tomato (0.008-0), and Chinese cabbage (0.032-0) but not in other crops; dieldrin and DDT were not detected. In market milk, total BHC residues decreased from 0.661 ppm in 1970 to 0.047 ppm in 1972. In mothers' milk they declined from 0.483 in 1970 to 0.288 ppm in 1971 (principally β-BHC). Soil BHC residues were higher in paddy fields (0.223) than in uplands (0.138) or orchards (0.201 ppm); dieldrin residues were higher in uplands (0.104) than in paddy fields (0.011 ppm). It was found that the residues accumulated in upper soil layers. Standard control measures have been suggested by the Ministry of Agriculture and Forestry. The Prefectural Conference on the Safe Use of Pesticides has promoted the stringent application of these measures.

76-0373. Nagasaki Prefectural Office. (Nagasaki, Japan). [**Determination of pesticide residues.**] *Nagasaki-Ken Kankyo Hakusho (Environ. White Paper, Nagasaki Prefecture)* 190; 1974. (Japanese)

In 1974, 85 specimens of fruits and vegetables grown in Nagasaki Prefecture were analyzed for residues of BHC, DDT, polychlorocyclodienes, arsenic, EPN, diazinon, carbaryl, malathion, etc. Nineteen species of cows' milk and 30 samples of other foods were analyzed for residues of BHC, DDT, and polychlorocyclodienes. No specimen contained residues in excess of the national standard.

76-0374. Nakagawa, M.; Tamari, H. (Sankyo Co., Ltd., Agric. chem. Res. Labs., Hiromachi, Shinagawa, Tokyo, Japan). [**Photodecomposition of credazine, 3-(2-methylphenoxy) pyridazine.**] *Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 48(12): 651-655; 1974. (19 references) (Japanese)

Sunlight irradiation was performed on the herbicide credazine, 3-(2-methylphenoxy) pyridazine, in 200 ppm aqueous solution at pH values of 6.8 and 9.0. After 3 weeks of exposure at pH 6.8, 65% of the starting compound remained unchanged. The photolysis rate was much greater, however, at pH 9.0. Major photolysis products at this pH were 3-pyridazinone-(2H) and *o*-cresol. A photonucleophilic substitution by hydroxide ion was apparently responsible for cleavage of the ether linkage. Other products included 3-(2-methylphenoxy) pyridazole 1-oxide, hydroxylated credazine, and salicyclic acid. The breakdown product *o*-cresol decomposed rapidly in aqueous solution, whereas 3-pyridazinone-(2H) remained stable even in sunlight. (From author abstract)

76-0375. Kawanishi, A.; Asanuma, S.; Suzuki, A. (Jpn. Inst. Rural Med., Nagano, Japan). [**Studies on organochlorine pesticide residues in the human body. Part 6.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 426-427; 1975. (Japanese)

Organochlorine pesticide residues in human adipose tissue were determined since the time when their use was banned. Residues of α- and β-BHC, *p,p'*-DDT, *p,p'*-DDE, and dieldrin were detected in all 45 specimens. The highest total BHC level found was 18.561 ppm, total DDT 35.328, and dieldrin 0.935 ppm; the average values were 2.957 ppm of β-BHC and 8.639 ppm of *p,p'*-DDE. Generally, all kinds of pesticides residues decreased bet-

ween 1971 and 1973; however, they have increased again since 1974. In adipose tissues taken from patients suffering from myasthenia gravis, bile duct calculi, stomach cancer, stroke, renal failure, gastric ulcer, myoma uteri, etc., higher levels of organochlorine pesticide residues were observed than in other diseases.

76-0376. Suzuki, Y.; Sugaya, H.; Sasaki, S. (Inst. Rural Med., Hiraga Gen. Hosp., Akita, Japan). [**Organochlorine pesticide residues in the human body. A 1974 report.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 428-429; 1975. (Japanese)

β-BHC, DDE, and *p,p'*-DDT were determined in human adipose tissue and mothers' milk. BHC and DDT were detected in all specimens in 1974. Residues increased between 1970 and 1972; they decreased slightly in 1973 and 1974, except for *p,p'*-DDT in 1974. In the organs of any individual, residue levels detected were highest in the kidneys, followed by the liver, spleen, and brain. Average concentrations of β-BHC, DDE, and *p,p'*-DDT found in adipose tissue were 2.269, 3.244, and 0.760, respectively, in 1970; 2.985, 1.268, and 0.600 in 1971; 3.985, 2.822, and 0.795 in 1972; 1.915, 1.486, and 0.562 in 1973; and 2.991, 1.776, and 1.519 in 1974. Average concentrations of these residues in mothers' milk were 0.650, 2.200, and 1.170, respectively, in 1970; 3.200, 2.480, and 0.830 in 1971; 6.105, 2.768, and 0.735 in 1972; 2.901, 2.075, and 0.274 in 1973; and 2.313, 1.728, and 0.511 in 1974.

76-0377. Takamiya, T.; Uchida, A. (Inst Agric. Med., Fac. Med., Chiba Univ. Chiba, Japan). [**Organochlorine pesticide residues in human placenta and blood.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 430-431; 1975. (Japanese)

In order to assess the translocation of organochlorine pesticide residues from the mother's body to the fetus, pesticide residues were determined in maternal blood, umbilical cord blood, and placenta after delivery as well as other women from rural districts in March-May 1974. The average concentrations of β-BHC and *p,p'*-DDE in umbilical cord blood, placenta, and maternal blood were 1.9, 5.7 and 7.7 ppb, and 1.8, 3.2 and 4.7 ppb respectively, with possible residues of dieldrin in some placenta and maternal blood specimens. Residues in maternal blood were closely correlated with those in umbilical cord blood. Average β-BHC levels of 4.6 ppb and *p,p'*-DDE levels of 5.6 ppb were detected in the blood of men living in rural areas.

76-0378. Ryan, J. B. (Rutgers The State Univ., New Brunswick, NJ). **Effect of pronamide on the growth and development of *Agropyron repens* (L.) Beauv.** *Diss. Abstr. Int. B* 36(5): 2001-2002; 1975.

Laboratory and field experiments were conducted between 1970 and 1972 to determine the effects of pronamide on the growth of quackgrass (*Agropyron repens* (L.) Beauv.) and assess its persistence and leaching in soil. ^{14}C-Pronamide applied to soil was readily taken up and translocated by quackgrass. Complete inhibition of rhizome root and shoot growth was obtained at 0.1 and 0.2 ppm pronamide in laboratory studies. Quackgrass regrowth from surviving rhizomes was rapid in nonretreated field plots. A wheat bioassay method was developed and used to determine pronamide soil residues in eight field experiments following fall applications. The majority of pronamide remained in the 0 to 2 in soil depth. Some leaching into the 2 to 4 in. depth was recorded. Pronamide residues decreased more, on the average, in tests in Virginia, Maryland, and New Jersey than in tests performed in Pennsylvania, Connecticut, and Massachusetts. Residues decreased at an equal rate, on the average, for all tests during the spring and summer. The soil residue half-life during the spring-summer period for the eight experiments ranged between 25 and 60 days. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-24,742).

76-0379. Deuel, L. E., Jr. (Texas A & M Univ., College Station, TX). **Residue levels of propanil, molinate, carbofuran, carbaryl, and their respective metabolites in rice paddy water.** *Diss. Abstr. Int. B* 36(5): 1997-1998; 1975.

Field experiments were conducted in a Beaumont clay soil, planted in rice, to determine the residue levels of propanil, molinate, carbofuran, carbaryl, and their respective metabolites in the paddy water with respect to time. Treatments included two application rates and two irrigation management systems. Propanil was dissipated within 24 hr after flood application. Propanil was degraded to DCA, which was irreversibly adsorbed to the colloidal fraction of the soil, blocking further transformation to TCAB. Although applied to the foliage when the soil was unsaturated, there was no evidence that the ensuing flood leached propanil and/or its metabolites to a depth of 2.5-5.0 cm or 17.5-20.0 cm. The half-life of molinate in granular form applied to the molinate flood was generally less than 100 hr, with no statistically significant residue remaining in the water 192 hr after application. Primary modes of dissipation were volatilization and biological degradation. Reducing conditions generated by permanent flood of the rice paddy influenced the dissipation rate of molinate. Carbofuran, applied in granular form to flood waters at the same time as molinate, was dissipated within 96 hr. No significant levels of 3-keto or 3-hydroxy-carbofuran were found in flood waters. Carbaryl concentration in paddy water corresponded to rainfall distribution; carbaryl was rapidly dissipated by an adsorptive mechanism. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-25,090.)

See also **76-0316** **76-0323** **76-0394** **76-0396** **76-0405** **76-0415** **76-0433** **76-0506** **76-0537** **76-0549**

76-0380. Okuyama, A.; Arima, T.; Toto, Y.; Imai, M.; Haraoka, S. (Okayama Univ. Med. Sch., Okayama, Japan). **A case of hypocholinesterasemia induced by trichlorfon.** *Acta Med. Okayama* 29(3): 233-236; 1975. (17 references)

One hour before hospital admission, a 26-yr-old housewife had taken 20 gm of trichlorfon with 200 ml of red wine for the purpose of suicide. This ingestion was followed by moderate toxic clinical symptoms. Serum cholinesterase fell to 0.30Δ pH/hr at one hr after intake, and to 0.05 Δ pH/hr about 12 hr after intake even though no toxic clinical symptoms were noted at this time. The depressed serum cholinesterase activity rose slowly in the following two weeks. Such a slow recovery of the serum cholinesterase has been reported in earlier studies, and is thought to be due to the slow rate of regeneration of cholinesterase in the liver.

76-0381. Davies, J. E.; Barquet, A.; Freed, V. H.; Haque, R.; Morgade, C.; Sonneborne, R. E.; Vaclavek, C. (Dep. of Public Health, Univ. Miami Sch. Med., Miami, FL 33152). **Human pesticide poisonings by a fat-soluble organophosphate insecticide.** *Arch. Environ. Health* 30(12): 608-613; 1975. (24 references)

In five cases of dichlofenthion poisoning due to suicide attempts, unusual toxicologic features were encountered. Initial symptoms were mild or delayed, and severe cholinergic crises did not appear until 40 to 48 hours after ingestion. Two patients died, and in the three survivors, cholinesterase symptoms persisted for five to 48 days. An almost total inhibition of both cholinesterase enzymes continued in one patient for 66 days, and prolonged antidotal therapy was required. Residues of the intact pesticide were detected in fat after 54 days in one patient, and in the blood for 75 days in another patient. The partition coefficient of dichlofenthion in fat was 20 times greater than that of parathion, and was exceeded only by leptophos. Considering the chemical and toxicologic properties of this compound, it was postulated that the mechanism of protracted intoxication is a slow release from adipose reservoirs. (Author abstract by permission)

76-0382. McLennan, M. W. (Dep. Vet. Clin. Studies, Univ. Queensland, St. Lucia, Queensland, Australia). **2,4-D toxicity in dairy cattle.** *Aust. Vet. J.* 50(12): 578; 1974. (4 references)

Within one hour following the accidental administration of 2,4-D to two cows, one cow became recumbent and appeared distressed. The other cow went down shortly afterwards. The cows were depressed, showed rumen stasis, excess salivation, normal temperatures, and elevated heart rates. Despite normal withdrawal reflexes, hind muscle tone, and tailtoe, the cows made no attempt to rise. Attempts to siphon fluid from the rumen were not successful. Treatment consisted of a mixture of mineral oil (2.25 liters) and magnesium sulphate (454 gm) via stomach tube. One cow died within 12 hours of administration. The other cow was given dextrose, antihistamines, and calcium borogluconate i.v. after some improvement was noted in its condition. One week later the farmer commenced lifting the cow with an abdominal sling and within a week the cow was able to lift itself and return to the milking herd. Determination of SGOT in the surviving cow showed 197 IU on day 2 and 156 IU on day 6. The fatal dose was between 150 and 188 mg/kg and the toxic dose between 105 and 132 mg/kg. This fatal dose was considerably less than had been previously suspected. A sample of the 2,4-D solution to which these cows had gained access was analyzed and contained 20% w/v 2,4-D present as the amine salt in aqueous solution.

76-0383. Malcolmson, E.; Beesley, J. (County Hosp., Hereford, England). **Unsuccessful immunosuppressant treatment of paraquat poisoning.** *Br. Med. J.* 3(5984): 650-651; 1975.

Two cases of paraquat poisoning are presented. Each patient (both men, aged 20 and 38 yr) was treated with immunosuppressants, and yet both patients died. The 38 yr old victim took one mouthful of paraquat concentrate. Twenty-four hr later bentonite was started orally to prevent intestinal absorption, and continued for 3 days. Forty-eight hr after poisoning immunosuppressive treatment was started with azathioprine (50 mg) and prednisone (10 mg) four times a day. Shortness of breath after mild exertion was noted on the 8th day. He died on the 15th day. Autopsy showed extensive pulmonary fibrosis. The second patient took four mouthfuls of paraquat concentrate. Oral bentonite (200 ml of suspension hourly) was started within the hour and continued for 2 days. On the 15th day he became short of breath and x-ray showed bilateral pulmonary shadowing. Azathioprine (50 mg) and prednisone (10 mg) with potassium aminobenzoate (one sachet) each four times daily were given but his condition worsened and he died 25 days after poisoning. Necropsy again showed extensive pulmonary fibrosis. It is suggested that larger doses of immunosuppressants started earlier in the course of therapy might have modified the course or the outcome of these 2 cases.

76-0384. Haberman, H. F.; Rosenberg, F.; Menon, I. A. (Clin. Sci. Div., Medical Sci. Bldg., Univ. Toronto, Toronto, Ontario, Canada). **Porphyria cutanea tarda: comparison of cases precipitated by alcohol and estrogens.** *Can. Med. Assoc. J.* 113(7): 653-655; 1975. (35 references)

A comparison was made of the clinical signs, biochemical and morphologic evidence of liver disease, results of serum iron studies, and response to therapy between two groups of patients with porphyria cutanea tarda (PCT). In one group of 7 patients the disease was precipitated by excessive alcohol consumption and in the other group, consisting of 9 patients, by estrogen therapy. It was noted that the signs of PCT appeared in one of the alcoholic patients soon after he had sprayed his fields with DDT. Reference is made to two earlier reports, one of

which is the Turkish epidemic of PCT which was traced to ingestion of a fungicide, hexachlorobenzene, used for preserving wheat, and the other cites several cases of PCT and chloracne acquired by industrial exposure to 2,4-dichlorophenol and 2,4,5-trichlorophenol.

76-0385. Liska, D.; Tildyova, K. (Katedra Hyg. ILF, Bratislava, Czechoslovakia). **Studium zmien aktivity niektorych enzymov v krvi pilotov a mechanikov, eponovanych organofosforovym pesticidom. [Study of the changes of activity of some enzymes in the blood of pilots and engineers exposed to organophosphorus pesticides.]** *Cesk. Hyg.* 19(6-7): 289-295; 1974. (15 references) (Czech)

The changes in the activity of cholinesterase, SGOT and SGPT (transaminases), AP, and LDH and its isoenzymes were studied in the blood of pilots and engineers occupationally exposed to organophosphorus pesticides. Organophosphorus pesticide exposure caused inhibition of cholinesterase in red blood cells and plasma, increased SGPT activity and also increased activity of isoenzymes LDH_1 through LDH_{50} particularly LDH_5 where the increase was statistically significant. These effects were noted 4 to 11 days after exposure to the pesticides. The maximum number of hours of exposure was 3 and flights averaged 30 per day. In the following year the exposure to these compounds ranged from 4 to 22 days, 10.6 days on the average, for an hourly average of 1.5-3.21 in individual workers. The employees had been exposed for periods of 3 to 19 yr. The results of this study indicate the importance of the problems of pesticide exposure and point to the urgency needed to solve the public health questions concerning aircraft applications of pesticides.

76-0386. Lindsey, A. W. (Hazardous Waste Management Div., U.S. EPA, Washington, DC 20460). **Ultimate disposal of spilled hazardous materials.** *Chem. Eng.* 82(23): 107-114; 1975. (21 references)

The decision-maker on the spill-response team directing the clean-up operation after a toxic material has been spilled must find an environmentally sound yet practical method of disposing of the contaminated material. Many organic pesticides undergo accelerated degradation via hydrolysis when treated with highly alkaline materials. Such pesticides include DDT, lindane, parathion, malathion, and demeton. Small terrestrial spills can be partly deactivated by spreading caustic soda over the surface and wetting down lightly. Solids can be partially deactivated by mixing them into caustic solutions or sandwiching them between layers of highly caustic chemicals, and then wetting slightly. Liquids should be causticized to a pH of 11 or higher. Concentrated materials are not to be so treated due to the liberation of volumes of noxious hydrogen chloride. Chemical oxidation can be used to treat aqueous solutions of aldrin and heptachlor by adding an excess of potassium permanganate. These techniques will accelerate breakdown, but it still may not be rapid. Testing must be carried out to determine the completeness of the reaction before the area can be ruled safe. Some of the intermediate breakdown products can be more toxic than the original compounds.

76-0387. Vettorazzi, G. (Health Environ. Res. Dep., Dow Chem. Co., Midland, MI). **Toxicological decisions and recommendations resulting from the safety assessment of pesticide residues in food.** *Crit. Rev. Toxicol.* 4(2): 125-185; 1975. (198 references)

Pesticide chemicals are reviewed for which an ADI has been recommended by the Joint Meeting of the WHO Expert Committee on Pesticide Residues up to 1974. The work is directed primarily to workers in the field of toxicology who are not completely familiar with the operations of the Joint Meeting and who wish to find an exhaustive source of references which might save hours of searching. In assembling the material for this summary, the following steps were carried out and this information is contained in the final paper: to sort out these pesticides for which either an ADI or a temporary ADI has been allocated; to list the common and chemical names as well as separate the compounds according to tentative chemical categories; to pinpoint documents containing information related to decisions that have been taken on each one; to transcribe the no-effect level(s) indicated as having served as a basis for establishing ADIs for man; to identify the studies in which the no-effect level(s) were demonstrated and to make reference to these studies as completely as possible; to construe the safety factor employed in the extrapolation process; and to indicate as many sources as possible which can offer additional information on the multifaceted process of toxicological and administrative decisions carried out by the Joint Meeting.

76-0388. Von Burg, R.; Rustam, H. (Dep. Pharmacol. Toxicol., Univ. Rochester, Sch. Med. Dent., Rochester, NY 14642). **Electrophysiological investigations of methylmercury intoxication in humans. Evaluation of peripheral nerve by conduction velocity and electromyography.** *Electroencephalogr. Clin. Neurophysiol.* 37(4): 381-392; 1974. (34 references)

In an attempt to elucidate the peripheral nervous symptoms associated with methylmercury intoxication, clinical and electrophysiological studies were conducted on Iraqi patients 7 months after cessation of exposure to this chemical. The fourteen patients had blood levels of mercury up to 3900 ng/ml at the height of the 1972 epidemic. During the current examination, the blood mercury levels ranged from 100 to 800 ng/ml. Evaluation was made of the motor and sensory conduction velocity, sensory threshold and sensory latency, the H reflex of the tibial nerve, and myoneural transmission. The results were negative, perhaps due to the clinical improvement in all patients tested. However, the electrophysiological studies showed evidence suggesting damage to the lower brain stem and a high incidence of interference with myoneural transmission. The exposure of the blood of 4 patients to

mercury had exceeded 3300 ng/ml. On electromyographic studies, 3 of these 4 patients demonstrated a myotonic-like response. The results of this study allow the conclusion that humans, moderately to severely intoxicated by methylmercury, may suffer damage to excitable tissues other than the cerebral cortex and cerebellum.

76-0389. Swartz, J. (Div. Biol. Control., Univ. California, Berkeley, CA). **Poisoning farmworkers.** *Environment* 17(4): 26-34; 1975. (17 references)

Farmworkers are often exposed to dangerous pesticides. Toxicity of combinations is often greater than that of individual pesticides. Workers don't always seek treatment for side effects of exposure to pesticides; many do not realize they are entitled to workmen's compensation for injury and others fear reprisals. Still others take for granted the side effects they experience in the field. Increased resistance of cotton pests to specific insecticides forces the use of more toxic organophosphates and the resulting injuries to workers increased dramatically from 7 cases in 1967 to 118 in 1968. Sometimes this exposure arises from working in a field too soon after spraying. Another study revealed that the number of hours lost/1000 hr worked due to pesticide illness was 5.25, which is higher than the equivalent figure of 4.9 hr lost/1000 hr worked reported by the supposedly highest risk industry in California, the construction industry. While it sounds relatively simple to keep track of the time since a field was sprayed and not to let workers reenter the field until the chemical has had enough time to degrade to a harmless state, such control requires much detailed knowledge which is not available. One of the strongest criticisms of the reentry time system is that the rate of degradation is based only on the laboratory studies or on the edible portion of the fruit. Even with laws and systems to protect the workers, such legislation can only be effective if it is enforced.

76-0390. Orjelick, R. (Div. Occup. Health Radiat. Control, Health Commission New South Wales, Australia). **Research finds aromatic amines exposure cause of increased number of tumors.** *Int. J. Occup. Health Saf.* 44(5): 46-47; 1975. (9 references)

Occupational exposure to a number of aromatic amines in dye, rubber, and other industries has been responsible for an increased incidence of urinary tract tumors. Since the implicated compounds enter the body by inhalation, by absorption through the intact skin, or by ingestion and subsequent absorption through the alimentary tract, individual worker hygiene is an important factor in preventing their absorption. Absorption should also be reduced by use of an enclosed manufacturing process. The proportion of bladder tumors which can be related to industrial exposures to carcinogens varies from 1% to 33%. Among the industries in which a causal relationship between aromatic amines and bladder cancer has been established is the ANTU rodenticide producing industry. ANTU is composed of α-naphthylthiourea and residual amounts of α- and β-naphthylamine. Similarly, the pesticide diphenylamine has demonstrated a strong association with bladder cancer.

76-0391. Lee, B. J. (Dep. Zool. Inst. Ecol., Univ. Georgia, Athens, GA). **Effects of mirex on litter organisms and leaf decomposition in a mixed hardwood forest in Athens, Georgia.** *J. Environ. Qual.* 3(4): 305-311; 1975. (24 references)

Mirex was applied to oak and dogwood both in corncob grit bait and in spray form. Macroarthropod fauna and microarthropod populations were monitored. The presence of ants on the plots was tested by use of blank bait and molasses. Mirex was used both at the normal and at ten times the normal amount. A significant acceleration in leaf litter decomposition was noted with each concentration. The two leaf species used showed significantly different decomposition rates. The slope of the ground surface on which the bags were placed influenced the decomposition process. Dogwood was more affected by the mirex than was the oak. Ants were essentially removed from the plots up to 79 days, but had returned by the 334th day after treatment. Macroarthropods captured included spiders, beetles, millipedes, scorpions, and centipedes. Since microarthropods, macroarthropods, and microflora are known to be involved in the decomposition, and since neither the microarthropods nor the macroarthropods could account for the change in decomposition, it was concluded that the groups most likely affected by the mirex were the bacteria and fungi. It is suggested that the mirex could have accelerated decomposition by inducing mixed-function oxidase systems in the microorganisms. If synthesis of more of these enzymes by fungi and/or bacteria allowed faster metabolism of the plant inhibitor, tannic acid, then decomposition could have received an early boost due to the growth of microorganisms usually limited by tannic acid.

76-0392. Roulier, M. H.; Landreth, R. E.; Carnes, R. A. (Solid Hazardous Waste Res. Lab., U.S. Environ. Protect. Agency, Natl. Environ. Res. Cent., Cincinnati, OH 45268). **Current research on the disposal of hazardous wastes.** *J. Hazard. Mater.* 1(1): 59-63; 1975.

Laboratory-sponsored project areas and studies are reviewed which are underway at EPA's Solid and Hazardous Waste Research Laboratory in Cincinnati. Studies relating to the migration of hazardous materials, liner materials, and pesticides are described. Pesticides present a special disposal problem because of the quantities and concentrations involved and cannot generally be handled by any of the methods described. Incineration of organic pesticides can be a convenient method of disposal, and a bench-scale research effort is making use of thermogravimetric techniques to establish time/temperature requirements for the incineration of 34 pesticides. Tentative operating parameters will be established for the safe

incineration of each compound, and a pilot-scale incinerator will be used to determine whether the laboratory data can be effectively scaled-up for all materials. These studies should permit the establishment of the minimum thermal conditions necessary for the degradation of certain organic pesticides.

76-0393. Dawson, G. W. (Battelle-Northwest, Richland, WA 99352). **Treatment of hazardous materials spills in flowing streams with floating mass transfer agents.** *J. Hazard. Mater.* 1(1): 65-81; 1975. (3 references)

Field studies were conducted in a flowing stream test facility to determine the parameters governing the application of floating media (in this case, commercially-available activated carbon) to flowing streams for the purpose to treating hazardous materials spills in situ. Spills were simulated with a solution of hexone, methanol, and rhodamine dye, and the dye content, total organic carbon content, and hexone content were used to characterize the spill. Removal efficiency was highly dependent on prompt location of the contaminant plume, even dispersion of the media over the water surface, and favorable environmnetal conditions. The technique described is most effective for concentrated plumes in small streams, and removal efficiencies increase as the size of the spill increases. Removal efficencies ranged from 50 to greater than 95%, depending on the substance tested. A scale effect was observed in static water testing: average removal was much better on a larger scale than in small field studies. A small acid spill in a semi-confined basin revealed very poor removal when compared to laboratory work. A much larger pesticide spill, however, resulted in removals comparable to those obtained in confirmed column work in the laboratory. The significance of edge and dilution effects is naturally greater in small scale applications.

76-0394. Livingston, J. M.; Goodwin, J. T. (USAF Environmental Health Lab., Kelly AFB, TX 78241). **The effect of ultra low volume aerial dispersal of naled on an aquatic habitat.** *Natl. Tech. Inform. Serv.*, AD-A003 630, *1974, 7 p. (1 reference)*

Ultra low volume aerial applications of naled (Dibrom 14) at 0.7 and 1.5 oz per acre were made at Robins AFB, Georgia, on 31 July 1974. The effects of the spray on non-target aquatic organisms were monitored utilizing caged fish, shoreline sampling, drift traps, drop traps, acetylcholinesterase levels in fish brain, and other observations. Acetylcholinestease activity in fish brains was depressed in the treated areas but no significant mortality of fish was noted. No gross effect on the normal fauna was observed. From this test it is concluded that no extensive monitoring activities are required for routine spray missions using conventional rates of naled, but closely spaced, multiple applications may require monitoring. (Author abstract by permission)

76-0395. Shih, C. C.; Tobias, R. F.; Clausen, J. F.; Johnson, R. J. (TRW Systems and Energy, One Space Park, Redondo Beach, CA 90278). **Thermal degradation of military standard pesticide formulations.** *Natl. Tech. Inform. Serv.*, AD-A008 023, 1975, 279 p.

The disposal of surplus military standard pesticide formulations is a serious environmental problem that has caused growing concern in recent years. The present study was aimed at providing key experimental data for the design of a prototype pesticide incineration system. A total of 14 chlorinated hydrocarbon military standard pesticide formulations have been investigated in the laboratory-scale incinerator, and it has been demonstrated that incineration is an extremely efficient process for the safe disposal of these pesticide formulations. Based on the experimental data, a minimum residence time of 0.4 second at temperatures above 1845°F and excess air in the range of 45 to 60 percent is recommended as the operating region for pesticide incineration. In addition, supplementary experiments indicated that pesticide incineration has little or no effect on the combustion chamber refractory liners, and that no significant agglomeration or breakdown of the dust particles would take place in the incineration of the dust formulations. (Author abstract by permission)

76-0396. Shama, S. K. (Natl. Inst. for Occupational Safety and Health, Parklawn Bldg., 5600 Fishers Lane, Rockville, MD 20852). **Health hazard evaluation/toxicity determination report 72-46-29, Sleepy Hollow Corp., Goshen, New York, and Gurda Farms, Goshen, New York.** *Natl. Tech. Inform. Serv.*, PB-229 168, 1973, 28 p.

In response to a request received from employers per the authority of Section PO(m)(6) of the Occupational Safety and Health Act of 1970, the National Institute for Occupational Safety and Health (NIOSH) conducted health hazard surveys to determine possible health hazards for migrant farmers from exposure to organic phosphate insecticides used at Sleepy Hollow Corp., Goshen, New York; and at Gurda Farms, Goshen, New York. Health hazard associated with worker exposure to anticholinesterase (anti-ChE) insecticides, the organophosphate compounds, was evaluated by blood analysis of the cholinesterase levels of workers in a low risk group (field workers and packers), in a high risk group (mixers and sprayers), and in a control group. Both groups showed probable absorption of organophosphorus insecticides. It is concluded that no significant health hazard existed for field workers but that a significant hazard could exist for mixers and sprayers if these workers did not handle the insecticides properly. Recommendations were made for monitoring the ChE levels of personnel directly involved with concentrated anti-ChE insecticides by pre-exposure and exposure ChE determinations. (Author abstract by permission)

76-0397. Moore, S. A., Jr. (The Marine Lab., Florida State Univ., Tallahassee, FL). **Impact of pesticides on**

phytoplankton in Everglades estuaries. *Natl. Tech. Inform. Serv.* PB-231 618, 1973, 100 p.

Six and 24-hour bioassays were conducted to determine in situ the effect of selected organochlorine compounds on natural communities of estuarine phytoplankton. The effect of organochlorine concentration observed was to reduce phytoplankton utilization of bicarbonate thereby also reducing photosynthetic production of organic material. Polychlorinated biphenyls (PCBs: Aroclor 1242 and Aroclor 1245) phytotoxicity occurred at PCB levels less than 5 μg PCB/1. *p,p'*-DDT phytotoxicity initiated at concentrations of 10 μg DDT/1. Phytotoxicity by dieldrin is inconclusive. No phytotoxicity was observed in one ecosystem. A typical dose-response toxicity was observed in a second ecosystem and indicated apparent dieldrin toxicity at 15 μg dieldrin/1. Nannoplankton and netplankton difference in Aroclor 1242 sensitivity was observed. 10 μg/l and 25 μg/l PCB did not inhibit nannoplankton which contributed approximately 73% of the phytoplankton production. Netplankton production was inhibited by more than 50% in both the 10 μg/l and 25 μg/l PCB concentrations. (Author abstract by permission)

76-0398. Anonymous. **Vaponastrip.** [**Vapona-strip.**] *Ned. Tidschr. Geneeskd.* 119(29): 1159-1160; 1975. (13 references) (Dutch)

Experiments and studies are reviewed on the possible health hazards involved in the use of Vapona strips, dichlorvos-impregnated PVC strips, for fly control in closed spaces. All studies and observations indicate that Vapona strips are perfectly harmless for man, which was objectively demonstrated by the absence of any change in the erythrocyte cholinesterase activity in patients in hospital rooms disinfected with dichlorvos. Dichlorvos has no mutagenic effects. Increased susceptibility to dichlorvos was observed in patients with liver insufficiency.

76-0399. Copland, G. M.; Kolin, A.; Shulman, H. S. (Sunnybrook Med. Cent., Toronto, Ontario, Canada). **Fatal pulmonary intra-alveolar fibrosis after paraquat ingestion.** *New England J. Med.* 291(6): 290-292; 1974. (16 references)

A 39-yr-old male ingested a "mouthful" of paraquat. Gastric lavage was performed. Blood nitrogen rose to 75 and the serum creatinine to 6.4 mg/100 ml at 3 days after admission and the patient became dyspneic. At day 5 the blood gases revealed a pH of 7.37, carbon dioxide tension of 32 mm Hg, base excess of -5mE/l and oxygen tension of 36 mm Hg. The patient's respiratory status worsened steadily from day 8 until death on day 26. A chest film obtained on day 5 showed a coarse linear pattern at the base of both lungs, with patchy consolidation and slight loss of volume. Films obtained just before death showed acute pulmonary edema. Autopsy showed both pleural cavities contained small amounts of clear fluid. Lungs were heavy and dark purple, with some degree of consolidation and decreased aeration in all areas, markedly at the bases, which were firm and virtually airless. Major bronchi and arteries were empty. The most intensive pulmonary abnormalities were in the basal areas of both lungs, sections of which showed extensive obliteration of the respiratory air spaces by fibrosis, with good preservation of the original structural framework. In this case of paraquat poisoning, extensive intraalvelar avascular fibrosis was found in all lung sections examined. Demonstration of basal membranes and reticulin confirmed the absence of both interstitial fibrosis and vessel growth. The only potentially pneumotoxic factor in the patient's history, other than paraquat ingestion, was the therapeutic administration of 100% oxygen for the last 2 weeks of life. However, the lack of interstitital pulmonary fibrosis and proliferation of capillaries makes it unlikely that oxygen toxicity was responsible for the toxic effects in the lungs of this patient.

76-0400. Goulon, M.; Nouailhat, F.; Escourolle, R.; Zarranz-Imirizaldu, J. J.; Grosbuis, S.; Levy-Alcover, M. A. (Clin. Reanimation, Serv. Neurol., Hosp. Raymond-Poincare, Garches, France). **Methyl bromide poisoning. Report of 3 cases with one death. Anatomical study in one case of stupor and myoclonus with a 5 years' survey.** *Rev. Neurol.* 131(7): 445-468; 1975. (57 references)

Reports on three patients (2 men and 1 women, aged 14-41 yr) are presented. Each suffered methyl bromide poisoning due to leakage from a fire extinguisher. After an initial period of coma and myoclonic status, two of the patients were characterized by an action myoclonus. Data from electrologographic, electromyographic, and electroencephalographic studies is presented. At follow-up 4 and 8 yr later, it appeared that two drugs, clonazepam and baclofene, had been particularly effective in treating two of the patients. The third patient remained comatose for a period of 5 yr when death occurred. The anatomical findings in this case consisted mainly of a necrosis of both inferior colliculi with gliosis in the upper brain stem reticular formation and moderate changes in the dentate and pontine nuclei. The significance of these anatomical findings is discussed in relation to physiological and experimental knowledge.

76-0401. Anderson, D. W.; Jehl, J. R., Jr.; Risebrough, R. W.; Woods, L. A., Jr.; Deweese, L. R.; Edgecombe, W. E. (U.S. Fish and Wildlife Service, P. O. Box C, Davis, CA 95616). **Brown pelicans: improved reproduction off the Southern California coast.** *Science* 190(4216): 806-808; 1975. (11 references)

Although still about 30 percent too low for population stability, productivity of California brown pelicans at their two northern colonies has improved significantly since 1971. Numbers of adults breeding probably reflect food supplies and recruitment from more successful colonies to the south, but improving fledging rates (up to 0.9 young per nest in 1974) reflect better egg survival and improving eggshell condition, with declining DDE con-

tamination in anchovies, their major food source. (Author abstract by permission)

76-0402. Anonymous. **Recommended classification of pesticides by hazard.** *WHO Chron.* 29: 397-401; 1975.

In this classification, hazard refers to the acute risk to health encountered accidentally by a person handling the pesticide according to the directions for handling prepared by the manufacturer or according to the rules for storage and transportation of the product as established by competent international bodies. The classification is based primarily on the acute oral and dermal toxicity to the rat. If the dermal toxicity would place a compound in a more restrictive class than the oral toxicity, then the dermal toxicity is used. If it has been shown that the rat is not the most suitable test animal for a particular compound, this is taken into consideration in determining the classification. Acute dermal toxicity must always be considered, as under most conditions of handling pesticides a high percentage of the total exposure is dermal. Special consideration is given if a particular chemical is known to produce toxic effects in man. It is urged that uniformity be adopted in the statement of the nature of the risk on the label of any product, irrespective of the country of origin or use. The text should be in the local language and for all fomulations should include the approved name of the active ingredient or ingredients, the method of use, and precuations to be taken in use. If sufficiently toxic, symptoms and immediate treatment of poisoning should be included. Detailed precautions necessary for the use of a pesticide depend on the nature of the fomulation and the pattern of use and are best decided by a pesticide registration authority when accepting a commercial label. International agreements on symbols to denote hazards from materials which are inflammable, corrosive, explosive, etc., are available and should be used where appropriate. Several examples of pesticide active ingredients and their formulations classified according to the WHO recommended scheme are presented.

76-0403. Kohout, F. (Landes-Vet., Rheinland-Pfalz, Koblenz, Germany). **Ueber die Vergiftung eines Pumas mit dem Fungizid Dichlofluanid.** [**Poisoning of a puma with fungicide dichlofluanid.**] *Zentralbl. Veterinaermed. Reihe A* 22(3): 256-259; 1975. (3 references) (German)

A case of fatal poisoning is reported in a male puma due to accidental ingestion of dichlofluanid (*N*-(dichlorofluoromethyl- thio)- *N'*,*N'*-dimethyl- *N*-phenyl sulfuric acid diamide). Intense pain and convulsions were observed in the dying animal. Pronounced pulmonary edema, degeneration of the myocardium, and hyperemia and acute stasis of the liver were found on autopsy. Stomach contents contained 25 g of dichlofluanid per kg. Dichlofluanid was determined colorimetrically by diazotization and complex formation with *N*-(1-naphthyl) ethylene diamine after alkaline saponification and clean-up on column chromatograph.

76-0404. Usutani, S.; Nishiyama, K.; Sato, I.; Komiyama, S. (Sch. Public Health, Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan). [**Studies on the prevention of pesticide hazards in apple growing. Fundamental investigations on labor and health management of cooperative applicators.**] *Hirosaki Igaku (Hirosaki Med. J.)* 27: 529-544; 1975. (5 references) (Japanese)

An investigation was carried out by questionnaire on the state of health management by members of cooperative pest control associations in April-June, in Aomori Prefecture, 1973. Twenty-two persons in 16 cooperatives out of a total of 309 cooperatives using speed sprayers and 23 individuals in 5 of a total of 53 cooperatives using stationary piping for pesticide applications received medical treatment for health impairments due to pesticides. Provision and utilization of protective measures such as protective creams, respirators, protective gloves, and showers were very poor. In particular, health education of the members was almost completely ignored, and participation in pesticide application was allowed to any person. The actual fequency of health examinations for pesticide applying personnel was exceptionally high.

76-0405. Sugaya, H. (Inst. Rural Med., Hiraga Gen. Hosp., Aomori, Japan). [**Pesticide poisoning and pesticide residues in the human body.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 434-435; 1975. (Japanese)

Cases of pesticide poisoning occurring in the past five years are presented. All clinical cases involving pesticides were included, such as acute intoxication; acute injury to skin, eyes, and nasopharynx; allergy; accidental ingestion; and attempted suicide. There are 904 case reports from these years; 178, 178, 207, 166, and 174 in 1970 through 1974. The number which occurred during application is 567; the number resulting from improper use and accident is 44. Organophosphate pesticides were involved in most cases. The most common injury was skin damage (405 cases), followed by acute intoxication. Both of these were primarily the result of incomplete protection in application. The results are also presented of determinations of organochlorine pesticide residues in human tissues. Residues were detected in all specimens examined, mainly β-BHC, DDE, and dieldrin. A declining trend was observed for BHC and DDT residues.

76-0406. Kudo, N. (Kudo Private Hospital for Internal Med. Aomori, Japan). [**Pathological physiology of pesticide intoxication. Part 17. Cultivation of tobacco plants and pesticide intoxication.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 436-437; 1975. (Japanese)

Numerous cases of pesticide intoxication have oc-

cured in the tobacco-growing area of Aomori Prefecture. The pesticide most commonly involved was methomyl (*S*-methyl- *N*-(methylcarbamoyl) oxy) thioacetimidate). Cases mainly occured in August just after pesticide application (61.5%), on the day after application (12.8%), or after dinner after pesticide application (61.5%). The major symptoms were nausea, dizziness, headache, dullness, dyspnea, and ocular hyperemia. It was found that the pesticide was applied in higher concentrations than is recommended. Twelve applicators were examined before and after morning applications, and after afternoon applications. Serum ChE activities generally declined but signs of recovery were seen; proteinuria occurred in some cases.

76-0407. Nishikawa, T.; Tsutsui, J.; Kato, J.; Suzuki, H. (Lab. Rural Med., Chusei Gen. Hosp., Mie, Japan). [**Pesticide pollution on farms of the Hane pear orchard area, Ueno City, Mie Prefecture.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 438-439; 1975. (Japanese)

Worker studies were performed on farms of the Hane pear orchard area. Data gathered included the frequency of pesticides application in individuals who displayed abnormal ChE in 1974; the incidence of abnormal ChE classified by kind of pesticide; and the time change in ChE of an individual, as well as lung function, hematologic findings, urologic findings, and subjective symptoms. About 61% of the individuals with abnormal ChE had histories of pesticide application. Abnormal ChE was present in 72% of individuals who had applied pesticides. Of persons with abnormal ChE, 72% applied EPN, 51% applied dithane (maneb), and 20-40% applied Kitazin-P, fenitrothion, or a mixture of the two. All individuals who applied benlate (benomyl), 2,4-D, or thiophanate showed abnormal ChE. In cases of GOT elevations, 74% had abnormal ChE as well. In the 1975 survey, the number of individuals who applied pesticides and had abnormal ChE values was very low, even during the busy season.

76-0408. Horiguchi, Y.; Yanagisawa, T. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies of the effects of organophosphorus pesticides on the central nervous system. Part 4. Results of tracing survey on long-term applicators.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 452-453; 1975. (Japanese)

Twenty-four men and women who applied organophosphorus pesticides for many years were examined over a 3 year period. EEG and neurological examinations were carried out in April and in June-July when they were working more actively. There were ocular symptoms and complaints of memory loss in April. In the busy season workers experienced somnolence, headache, and general malaise. An abnormal increase in slow alpha activity was noted in the EEGs of both sexes. A reduced ChE activity was observed in 70-80% of the men regardless of season.

76-0409. Okubo, S.; Kanazawa, Y.; Tachikawa, H., Hayashi, S.; Komatsuda, H.; Hirata, M.; Watanuki, T. (First Sch. Int. Med., Fac. Med., Akita Univ., Akita, Japan). [**Findings in two autopies performed after fatal acute paraquat dichloride poisoning.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 460-461; 1975. (Japanese)

A 37-year-old farm woman swallowed a very small amount of dilute aqueous solution of paraquat dichloride with suicidal intent and was hospitalized, reporting only anorexia with conspicuous stomatitis on the fifth day after ingestion. Pyrexia (temperature 38°C) with clouding of consciousness, dyspnea and cough were noted. The patient was treated with infusions and large amounts of antibiotics and adrenal cortex hormones. On the 11th day, she complained of tightness in the chest; an arterial blood gas analysis was carried out and oxygen was given. On the nineteenth day, an exchange transfusion was performed (1800 ml.). She died on the twentieth day with cough and repeated paroxysms. Autopsy revealed changes in the lung, consisting of inflammation of alveolar septa, intra- and perialveolar fibrosis, and secondary organization of alveolar vacuolation or formation of gassy membranes. Changes in the central area of the liver and the nerve cells in Ammon's horn were attributed to impaired circulation and hypoxia. The second cause involved a 70-year-old woman who swallowed 30 ml of paraquat dichloride (24%). She died on the 3rd day with findings of cerebral infarction, hemorrhagic aspiration pneumonia, corrosive gastritis, liver focal necrosis, and shock kidney.

76-0410. Anonymous. [**Rapid decline in accidental pesticide poisonings; slower drop in suicide and homicide cases.**] *Noyaku Bijinesu (Pestic. Business)* 224: 1828-1829; 1975. (Japanese)

According to the Japan Ministry of Public Welfare, the total number of accidents due to pesticides was 641 in 1974, far less than the 810 in 1973. The major factor in the reduction was the reduction of poisonings during pesticide application, with only one fatality in this year. Cases of homicide, suicide, and misuse were not so extensively reduced. By prefecture, the numbers of poisoning cases during application were greatest in Akita Prefecture, 106 in 1972 and 89 in 1973. In 1974, 35 prefectures reported no accidents during pesticide application. Cases of homicide and suicide by parathion, which has not been produced and marketed for the past few years in Japan, were 41 in 1973 and 30 in 1974. The number of accidents during pesticide application declined after the regulations were made more strict.

76-0411. Watanabe, H.; Shirai, O.; Ebata, N. (Sapporo Med. Coll., Sapporo, Japan). [**A case report of organophosphorus insecticide (DDVP) intoxication with respiratory intensive care.**] *Sapporo Igaku Zasshi (Sapporo Med. J.)* 43(5): 334-337; 1974. (13 references) (Japanese)

A case of attempted suicide is described in which

the patient recovered from intoxication by ingestion of *O,O*-dimethyl- 2,2-dichlorovinyl phosphate (dichlorvos, DDVP). A 56-year-old woman, weighing 45 kg, was brought into a hospital 3-5 hr after she ingested about 90 ml of 5% DDVP. Findings on admission were blood pressure 120/110, pulse 110, contracted pupils, slight clouding of consciousness, and medicinal breath odor. Slight rales were heard in the right side of the chest and her respiration was very poor. Removal of tracheal foreign material was attempted using an endotracheal tube; only a small quantity of highly viscous material could be removed, and this produced little improvement in the respiratory condition. Gastric lavage was done; however, no specific material was detectable in the stomach. Then 1.0 mg of atropine sulfate, 1 g of pralidoxime (PAM), 1 g of hydrocortisone, 60 ml of 7% sodium bicarbonate, and 0.2 mg of deslanoside were administered to the patient i.v. without producing any change in condition. After administration of additional atropine sulfate, 4.0 mg after 1 hr and another 4.0 mg after 1.5 hr, expansion of the pupils and increased pulse rate were noted; however, no improvement in respiratory condition was yet obtained. The patient was placed on an artificial respirator, but this could not be synchronized with her spontaneous respiration because of her high respiration rate (50 times/minute). This excessive rate was reduced by medication. After 4 days of hospitalization, spontaneous and artificial respiration could be employed alternatively, and the artificial respirator was completely removed by the 9th day. The patient was removed from the intensive care unit on the 14th day. The test results for liver and kidney function during the recovery period indicated no abnormality except in the urinary protein. Although the amount of DDVP ingested by the patient was estimated to be about 4.5 g, which is in excess of the human lethal dose and nearly twice the rat lethal dose, the degree of intoxication was relatively slight, and both atropine sulfate and PAM worked effectively. If the estimated ingestion was correct, the toxicity for humans would seem to be smaller than that for rat, and DDVP decomposition and elimination of its decomposition products from the human body would be faster than from rats, assuming appropriate treatment.

See also **76-0307** **76-0316** **76-0317** **76-0321** **76-0330** **76-0353** **76-0449** **76-0498** **76-0524**

76-0412. Weiss, S. V.; Beckert, W. H. (Dep. Biol. Sci. St. John's Univ., Jamaica, NY 11439). **Herbicide effects on cultured animal cells.** *Abstracts Fifteenth Annual Meeting Am. Soc. Cell Biol.*, 1975, p. 451a.

Monkey kidney cells, Girardi heart cells, and rainbow trout gonad cells were exposed to dalapon, fenuron, 2,4-D, and diquat in concentrations of 10, 50, 100, and 500 ppm for periods of 24, 72, or 120 hr. Light and electron microscopy examinations were conducted to determine the ultrastructural effects of these herbicides. The changes observed in these cells were often similar to the effects these herbicides have on their intended plant targets. However, the effects were more rapidly occurring and were more severe as the concentration and length of exposure increased. Complete inhibition of mitosis, pyknosis, extension chromatin margination, decreasing numbers of nucleoli, and disruption of the nuclear envelope were caused by dalapon. Decreased mitotic activity with irregularity of nuclear shape and increased chromatin margination were noted on exposure to fenuron. Increased mitotic activity and amounts of chromatin resulted from exposures up to 72 hr with 10 or 50 ppm 2,4-D. These phenomena were abruptly reversed upon exposure to higher concentrations or for longer periods of time; decreased nuclear size and greater variation in shape were also noticed. Cessation of mitotic activity, intense nuclear staining, and breakdown of the nuclear envelope were noted from exposure to diquat. It was concluded that these compounds are highly damaging to these cells.

76-0413. Kreczko, S.; Zwierz, K.; Jaroszewicz, K. (Lab. District Industrial Outpatient Dep., Inst. Physiol. Biochem., Med. Acad., Bialystok, Poland). **Glycoprotein biosynthesis by the guinea pig liver in chronic 4,6-dinitro-*o*-cresol poisoning.** *Acta Biol. Acad. Sci. Hung.* 25(3): 167-171; 1974. (20 references)

A study was conducted to determine the influence of 4,6-dinitro-*o*-cresol (DNOC) intoxication on the biosynthesis of glycoproteins in the liver of the guinea pig. Thirty male guinea pigs weighing 350 to 400 g and 8-12 months old were given DNOC i.v. in doses of 0.3 LD50/day for 30 days, 6 times a week. The concentration of DNOC in the blood of the poisoned animals varies from 21 to 32 μg/ml while animals in the control group showed no DNOC in their blood. The aminosugar content was significantly higher in both liver and serum of poisoned animals. Sialic acid content was significantly increased in the liver and serum of poisoned animals. A decrease was noted in the glycoprotein content of the albumin and alpha$_2$ globulin fractions, with a simultaneous increase in the alpha$_1$ and globulin fractions of poisoned animals. A slight increase was noted in the beta globulin fraction. The significant increase in the aminosugar and sialic acid contents of the liver was explained by the increase in biosynthesis of glycoproteins in this organ. The ability of DNOC to stimulate the secretion of completed glycoproteins into the blood stream may explain the significant increase in serum aminosugars and glycoproteins. The findings of this study suggest that DNOC selectively blocks the biosynthesis of some proteins and/or stimulates that of others, particularly those containing high amounts of sugars in the molecule. The increased biosynthesis of sugars in the liver and raised serum glycoprotein levels observed in chronic intoxication by DNOC may be due to increased availability of sugar phosphates in the course of stimulation of glycolysis by DNOC and/or reaction to toxic damage of the liver lysosomes by DNOC.

76-0414. Nagy, Z.; Mile, I.; Antoni, F. (First. Inst. Biochem., Semmelweis Univ. Med. Sch., Budapest, Hungary). **The mutagenic effect of pesticides on *Escherichia coli* WP2 *try*.** *Acta Microbiol. Acad. Sci. Hung.* 22(3): 309-314; 1975. (20 references)

The present report described the effects of a number of pesticides registered for use in Hungarian agriculture, and of well-known chemical mutagens, on reverse mutation in the *her* and *her-* derivatives of *Escherichia coli* WP2 strain, using the spot test technique. The compounds studied included dichlorvos, phosphamidon, gardona 50 WP (tetrachlorvinphos), sumithion 50 EC (fenitrothion), formothion, fenthion, malathion, diazinon, metham, carbaryl, dithane M-45 (mancozeb), parzate (nabam), Bercema-ferbam 50, captan, folpet, chloroxuron, aresin (monolinuron), alktion, buvinol, cosan (sulfur), granosan, pol-thiuram (thiram), dinocap, lindane, novenda, tetradifon, diphenamid, trichlorfon, gomex, and 2,4-D. Captan and dichlorvos were mutagenic for both *her* and *her-* strains, whereas folpet was detectably mutagenic only for the *her-* strain. The mutagenic effect of tetradifon was variable and was observed only in the *her-* strain. These 4 pesticides are extensively used in agriculture and gardening. It would be of interest to expand these investigations on the mutagenicity of these substances to higher organisms.

76-0415. Strzelec, A. (Dep. Agric. Microbiol., Inst. Soil Sci. Plant Cultivation, Pulawy, Poland). **Effect of simazine on growth of microorganisms and decomposition of this preparation in various types of soil.** *Acta Microbiol. Pol. Ser. B* 7(1): 3-13; 1975. (21 references)

The decomposition of simazine was studied in soils of various physical and chemical properties and different microbial activity. The five types of soil used in the study were: pseudopodzolic soil developed from slightly loamy sand, pseudopodzolic soil developed from light loam, brown soil developed from heavy loam, brown proper soil developed from loess, and black degrade earth developed from medium loam. During the course of the experiment the greatest numbers of bacteria and actinomycetes were found in black earth and loess, and the smallest ones in heavy loam. Depending on soil properties, the addition of simazine either inhibited or periodically stimulated the growth of bacteria and actinomycetes. In all soils, with the exception of the heavy loam, the total number of microorganisms was markedly decreased when the herbicide was

incorporated into the soils. This inhibitory period lasted 2 months, at which time an increase in the total number of microorganisms compared to control soils was noted. Simazine introduction into brown soil developed from heavy loam stimulated the total number of microorganisms in the first period; this was followed by a decrease in their number as compared to controls. The rate of simazine decomposition depended on soil sorption properties, the contents of N and C, and the number of microorganisms. In soils characterized by high sorption properties, simazine was retained longer than in soils with lower sorption ability. The rate of simazine decomposition was higher at a higher C/N ratio.

76-0416. Takeda, Y.; Tsukahara, I.; Takemoto, I.; Takarori, S. (Dep. Opthamol., Kansai Med. Univ., Moriguchi-shi, Osaka, Japan). **Antagonistic effects of glutathion to chlorfenvinphos—an organophosphate insecticide.** *Nippon Ganka Gakkai Zasshi (Acta Soc. Ophthalmol. Jpn.)* 75(4): 45-49; 1975. (25 references) (Japanese)

A study was made of the antagonistic action of glutathione toward the effects of an organophosphate insecticide, chlorfenvinphos, on the central visual pathway of gallamine-immobilized cats. No change in amplitude was noted in the ERG and visually evoked responses to photic stimulation in the lateral geniculate body after administration of glutathione. However, responses in the optic tract slightly decreased, and those in the visual cortex increased in amplitude. Chlorfenvinphos caused an increase in the ERG amplitude and evoked responses in the optic tract and a decrease in amplitude in the lateral geniculate body. Chlorfenvinphos also showed a tendency to increase the amplitude of evoked responses in the visual cortex. It was concluded from the results of these studies that glutathione depresses the effects of chlorfenvinphos on the ERG and evoked responses in the optic tract and the lateral geniculate body.

76-0417. Ando, M.; Iwasaki, Y.; Nakagawa, M. (Agric. Chem. Res. Lab., Sankyo Co., Ltd., Tokyo, Japan). **Metabolism of isoxathion, *O,O*-diethyl *O*-(phenyl-3-isoxazolyl) phosphorothioate, in plants.** *Agric. Biol. Chem.* 39(11): 2137-2143; 1975. (15 references)

The absorption and metabolism of the insecticide, Isoxathion, on bean, cabbage and chinese cabbage plants were examined using carbon-14 labeled compound. Isoxathion penetrated into plant tissues was hydrolyzed to produce 3-hydroxy-5-phenylisoxazole, which was then rapidly converted to water soluble compounds. Among them, 3-(β-D-glucopyranosyloxy) -5-phenylisoxazole, 2-(β-D-glucopyranosyl) -5- phenyl-1-isoxazolin-3-one and 2-(β-D-glucopyranosyl) -5-*p*-hydroxy-phenyl -4-isoxazole-3-one were unequivocally identified as the major metabolites. Another metabolic pathway of 3-hydroxy-5-phenylisoxazole via a reductive cleavage of the isoxazole ring to form benzoic acid was negligible. (Author abstract by permission)

76-0418. Dustmann, J. H. (Landesinst. Bienenforsch., Celle, Germany). **Wirkung von Tormona 80 auf Honigbienen. [The effect of Tormona 80 on honey bees.]** *Allg. Forstz.* 30(45): 978-979; 1975. (German)

Laboratory and field experiments on the toxicity of Tormona 80 (2,4,5-T) to honey bees are presented. Laboratory tests in which bees were wetted directly with Tormona 80 or in which the pesticide was administered orally showed that this preparation is not hazardous to bees. The LD50 was determined to be 50 μg/bee. The hazards of poisoning via oral uptake are reduced by the slight repellant effect of the preparation. Tormona 80 was also found not to be hazardous in field experiments. If used according to instructions it caused no increased mortality and did not interfere with the orientation function of the bees. Honey collected by such bees in areas after application of Tormona 80 contained no residues of 2,4,5-T at a detection limit of 0.005 ppm.

76-0419. Moffett, J. O.; Morton, H. L. (USDA, ARS, Bee Res. Lab., Tucson, AZ, 85719). **How herbicides affect honey bees.** *Am. Bee J.* 115(5): 178-179, 200; 1975. (12 references)

Studies were conducted to determine how herbicides applied at various rates and by various methods, other than dusting, might affect honey bees. Some herbicides appeared relatively nontoxic. Others, such as picloram, may be beneficial. Herbicides which were highly toxic when fed or sprayed on colonies were paraquat, MAA, MSMA, DSMA, hexaflurate, and cacodylic acid. Diesel oil and a phytobland oil, used as carriers, were toxic the first day they were sprayed on bees. Although the phenoxy herbicides (2,4,-D, 2,4,5-T, silvex, etc.) were relatively non-toxic to adults, they stopped brood rearing and prevented eggs from hatching when high concentrations were fed to colonies in sugar syrup or water. Soon after this feeding was stopped, the colonies returned to normal. Surfactants drowned large numbers of bees for as long as six months after they were placed in a water supply. Residues of 2,4,5-T were found in honey bees, honey, and wax in small and perhaps unimportant amounts for more than one year. Aerial spraying of 2,4-D, 2,4,5-T, and a cotton desiccant did not cause any noticeable loss of honey bees when colonies were located in the sprayed area. The results of this study indicate that some factors which influence the losses of honey bees include the rate of application, the herbicide used, the method and time of application, the sources of water available, the plants to which the herbicide is applied, and the location of nectar, pollen, and water sources for the bees. It is concluded that the greatest danger lies in the use of oils high concentrations of DSMA, MSMA, paraquat, and similar chemicals which are employed to kill all vegetation to which they are applied. This is done frequently to control plants along and in irrigation ditches, and along rights-of-way for railroads and highways.

76-0420. Street, J. C.; Chadwick, R. W. (Dep. Anim. Sci., Utah State Univ., Logan, UT 84322). **Ascorbic acid requirements and metabolism in relation to organochlorine pesticides.** *Ann. N. Y. Acad. Sci.* 258: 132-143; 1975. (9 references)

Those organochlorine pesticides which possess both high lipid solubility and high resistance to biodegradation are likely to accumulate in animal tissues and produce relatively long-term effects as toxicants. Such compounds, typified by DDT, dieldrin, and lindane, are profound inducers of hepatic microsomal enzymes, including parts of the glucuronic acid and ascorbic acid biosynthetic pathways. Consequently, administration of such pesticides to rats is accompanied by enhanced formation and excretion of D-glucuronic acid and L-ascorbic acid, or D-glucaric acid in the case of guinea pigs. The efficiency with which the pesticides are biodegraded is also reduced in ascorbic-acid-deficient guinea pigs, with correspondingly greater residue accumulation in their tissues. This would aggravate the chronic toxic effects of the compounds. Finally, the capacity of the liver to adapt to the presence of such toxicants through enhanced microsomal enzyme levels appears to be sensitive to its ascorbate status. Impaired enzyme induction is apparent quite early during ascorbic acid depletion in guinea pigs. The enhanced turnover of ascorbate produced by such pesticides, the poor enzymatic adapation to them during ascorbate depletion, and the dependence of the oxidase system upon adequate ascorbate all point to the central significance of the ascorbate status in the liver, and possibly in other tissues, as a determinant of the pesticides' chronic toxicity.

76-0421. Schricker, B. (Inst. Gen. Zool. Exp. Morphol., Free Univ., Berlin, Germany). **Der Einfluss subletaler Dosen von Parathion (E 605) auf die Entfernungsweisung bei der Honigbiene. [The effect of sublethal doses of parathion (E 605) on the indication of distance in honeybees.]** *Apidologie* 5(2): 149-175; 1974. (47 references) (German)

Experiments were conducted to determine the effect of sublethal doses of parathion (less than 0.03 g) on honeybees. The parathion dose was administered p.o. Treated bees signaled the distance to the hive as too short as a result of an increased wagging-dance rhythm. No difference could be detected when those dances were performed on a comb in vertical or in horizontal position. The incorrect information given by these poisoned bees is taken as accurate by recruit bees and thus they are misled. Identical results were obtained when foragers were trained to an artificial feeding site, poisoned there, and released there or transferred immediately to an unknown location. The speed of flight of the poisoned bees measured in phototactic runs toward an artificial light source was increased by about 10%. The effect of these sublethal parathion doses on the dance rhythm diminished after about 2.5 hr. No effect was visible by 5.5 hr. A suggestion of the probable mode of action of parathion is presented along with a probable correlation between dance rhythm and measurement of distance.

76-0422. Haider, K.; Jagnow, G. (Inst. Biochem. Boden, Inst. Bodenbiol., Forschungsanst. Landwirtsch., Braunschweig, Germany). **Abbau von ^{14}C-, ^{3}H- und ^{36}Cl-markiertem γ-Hexachlorocyclohexane durch anaerobe Bodenmikroorganismen. [Degradation of ^{14}C-, ^{3}H- and ^{36}Cl-labeled γ-hexachlorocyclohexane by anaerobic soil microorganisms.]** *Arch. Microbiol.* 104(2): 113-121; 1975. (23 references) (German)

Up to 90% of the γ-hexachlorocyclohexane (γHCH, lindane) applied to an anaerobic mixed bacterial flora enriched from an arable soil were degraded within 4—5 days. Degradation resulted in a rapid release of chloride and in formation of chlorine-free volatile metabolites. CO_2 formation from the molecule was not detected. Investigations with ^{14}C/^{3}H- and ^{36}Cl/^{3}H double-labeled γ-HCH indicated that the release of Cl and H did not occur in the ratio of 1:1. More Cl than H was split off. The volatile compounds contained more ^{14}C than ^{3}H. Gas chromatographic studies also showed the rapid decrease of γ-HCH and the formation of several metabolites. γ-Pentachlorocyclohexene was not detected. Increased O_2-contents in the gas phase of cultures resulted in decreases of the compound's degradation. Release of chloride and of volatile metabolites were observed with O_2 contents in the gas phase up to 5%. α-HCH was also degraded by the anaerobic mixed flora but more slowly than with γ-HCH. Chloride was released and volatile, chlorine-free metabolites were found. (Author abstract by permission)

76-0423. Seiler, J. P. (Swiss Fed. Res. Stn., Waedenswil, Switzerland). **The molecular mechanism of benzimidazole mutagenicity: in vitro studies on transcription and translation.** *Biochem. Genet.* 13(9/10): 635-641; 1975. (14 references)

In vitro studies were carried out in an attempt to understand the molecular mechanism of benzimidazole mutagenesis. Benzimidazoles, including compounds widely used as agricultural fungicides, are weak mutagens which act through base substitutions. They are incorporated into nucleic acids. Benzimidazole nucleoside triphosphate is polymerized by RNA polymerase only in the presence of poly dc, i.e., instead of guanine, in experiments using deoxyribohomopolymers as templates. Benzimidazole ribonucleoside diphosphate is polymerized by polynucleotride phosphorylase in plasmolyzed *Escherichia coli* cells, and after blocking of the normal mRNA synthesis with actinomycin D, can be used as a messenger for polypeptide formation. By adding radioactive amino acids to this system it is shown that benzimidazole is not read preferentially as guanine, as would have been expected from the RNA polymerase results. Instead, the reading was position-dependent and benzimidazole is recognized in the first codon position as adenine, in the second as purine, and in the third possibly only as base. Thus the mutagenicity of benzimidazole is explained as a G—A transition.

76-0424. Yoshida, T.; Suzuki, Y.; Uchiyama, M. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai 980, Japan). **Effect of fenitrothion on δ-aminolevulinic acid synthetase activity of mouse liver.** *Biochem. Pharmacol.* 24(21): 1996-1997; 1975. (13 references)

Hepatic δ-aminolaevulinic acid synthetase (ALA synthetase) activity was determined in mice after treatment with fenitrothion. A significant increase in ALA synthetase activity was noted shortly after the administration of fenitrothion at a dose level of 100 mg/kg. The peak value was reached within 4 hr of admission and declined to the original activity within 12 hr. Maximum increase was about 2.2 times control levels. This increase may have been due to an increase in new enzyme protein rather than to activation or stabilization of preexisting enzyme, as pretreatment with cycloheximide prior to administration of fenitrothion completely abolished the increase in ALA synthetase activity. The transient increase in ALA synthetase activity coincided well in time with the decrease in cytochrome P-450 after the administration of fenitrothion, which suggests that the compensation for the decrease in cytochrome P-450 seems to act through a mechanism of induction of ALA synthetase. Fenitrothion produced a dose-related increase in ALA synthetase activity. The maximum increase was achieved using the 200 mg/kg dose level. Repeated administration of fenitrothion to mice increased cytochrome P-450 content and drug-metabolizing activity. It is concluded that a relation exists between alterations in microsomal drug-metabolizing enzyme activity and ALA synthetase activity after the administration of fenitrothion. This study marks the first demonstration of the induction of ALA synthetase by fenitrothion.

76-0425. Bhagwat, V. M.; Ramachandran, B. V. (Biochem. Div., Natl. Chem. Lab., Poona 411 008, India). **Enzymic hydrolysis of malaoxon by mouse liver homogenates.** *Biochem. Pharmacol.* 24(21): 2002-2003; 1975. (8 references)

In an effort to determine whether malaoxon is both an inhibitor and a substrate for nonspecific carboxylesterases, malaoxon suspensions of 1.5 m*M* Tris-HCl buffer pH 7.6 containing Triton X-100 were incubated at 37° with 0.5 - 2.0% mouse liver homogenate. Aliquots of the digest were extracted at 5 min intervals up to 60 min with an equal volume of isobutanol-benzene (1:1), and the residual malaoxon was assayed after evaporation of the solvent. It was determined that the hydrolysis of malaoxon under these conditions was negligible. Malaoxon is obviously only an inhibitor of non-specific B-esterases. In 0.05 *M* Tris-HCl buffer, pH 8.8, the activity was low when no SH group activator was added. In the presence of 10 m*M* 2-mercaptoethanol in the buffer and 10m*M* reduced glutathione in the digest the activity was 26.1 ± 6.1 μmole malaoxon/g liver/hr. The addition of 0.01 m*M* DFP did not significantly alter the value. It is therefore concluded that malaoxon esterase is an A-type esterase and the B-type of esterase is without effect on malaoxon.

76-0426. Hunter, A. L.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ., Nashville, TN 37232). **Inhibition of hepatic mixed-function oxidase activity in vitro and in vivo by various thiono-sulfur-containing compounds.** *Biochem. Pharmacol.* 24(23): 2199-2205; 1975. (29 references)

Nuclear uptake of radioactive acetate into rat liver histones in vitro peaked at 2 and 24 hr after α-HCH (α-BHC) application, when control values were exceeded by approximately 200%. The magnitudes of acetate uptake into histone fractions of rats treated with α-HCH for 24 hr and of control rats were in the following order: F3 > F2b > F2a1 > F2a2. Retention of radioactive acetate in F3 and F2a1 histone fractions of rats pretreated with α-HCH for 24 hr accounted for 61% of the radioactive acetate retained in total histones, which was nearly seven times higher than in histones of control rats. Preincubation of rat liver nuclei isolated 24 hr after α-HCH administration with acetyl-coenzyme A resulted in an enhancement of the already α-HCH stimulated RNA synthesis. This, as well as the coincidence of maximally increased acetate content in histones and increased nuclear RNA synthesis 24 hr after α-HCH, suggests a connection between the two nuclear processes. No effect of preincubation with acetylcoenzyme A was seen on RNA polymerase activities in liver nuclei from rats pretreated for 2 hr with α-HCH which also contain highly acetylated histones or in the liver nuclei from control rats. So it is assumed that beside the increase of histone acetate content additional conditions need to be fulfilled to start and to guarantee the α-HCH induced gene activation in rat liver. (Author abstract by permission)

76-0427. Sarkander, H. I.; Brade, W. P. (Pharmakol. Inst., Freie Univ. Berlin, D-100 Berlin 33, Germany). **(Studies on the in vitro turnover of histone acetyl groups and the increase of RNA synthesis in rat nuclei after in vivo application of α-hexachlorocyclohexane (α-HCH).** *Biochem. Pharmacol.* 24(24): 2279-2285; 1975. (36 references)

Ten thiono-sulfur-containing compounds of varying structure were administered by intraperitoneal injection to untreated, phenobarbital-pretreated and 3-methylcholanthrene- pretreated adult male rats. Six hr later the concentration of hepatic cytochrome P-450 and the ability of the hepatic microsomes to metabolize benzphetamine were examined. In the untreated phenobarbital-pretreated and 3-methylcholanthrene-pretreated groups, two, four and four compounds, respectively, significantly decreased the concentration of cytochrome P-450 in the hepatic microsomes. A similar effect on benzphetamine metabolism was also seen. When examined 48 hr after the administration of the ten thiono-sulfur-containing compounds, four, five and seven of the compounds decreased both the levels of hepatic cytochrome P-450 and the rate of benzphetamine metabolism in the untreated phenobarbital-pretreated and 3-methylcholanthrene-pretreated animals respectively. Eight of the thiono-sulfur-containing compounds were in-

cubated in the presence of NADPH with hepatic microsomes isolated from untreated phenobarbital-pretreated or 3-methylcholanthrene-pretreated animals. All of the compounds examined significantly decreased the concentration of cytochrome P-450 in the microsomes from each treatment group. Similar reductions in benzphetamine metabolism were also seen. When these same compounds were incubated with microsomes in the absence of NADPH, no significant reduction of cytochrome P-450 or benzphetamine metabolism was seen. When the oxygen analogs of six of the thiono-sulfur compounds were administered in vivo or incubated with hepatic microsomes either in the presence or absence of NADPH, no significant reduction of cytochrome P-450 or benzphetamine metabolism was seen. (Author abstract by permission)

76-0428. Krupka, R. M. (Agric. Canada., Res. Inst., Univ. Sub Post Office, London, Ontario, Canada). **Differential effects of denaturing agents on acetylcholinesterase: insensitivity of the reaction of methanesulfonyl fluoride compared to diisopropylphosphorofluoridate and *p*-nitrophenyl acetate.** *Biochem. Biophys. Acta* 410(1): 115-119; 1975. (18 references)

The effects were studied of various agents (alcohols, dimethylsulfoxide, dimethylformamide, dinitrobenzene, urea, and guanidine hydrochloride) on the reaction of electric eel and bovine acetylcholinesterase with a substrate, *p*-nitrophenyl acetate, and two irreversible inhibitors, diisopropylphosphorofluoridate (DFP) and methanesulfonyl fluoride. In all three of these reactions, an acyl group (acetyl, phosphoryl, or sulfonyl, respectively) bonds covalently with the active center of the enzyme. As expected, the reactions of acetylcholinesterase with *p*-nitrophenyl acetate and diisopropylphosphorofluoridate were severely retarded by most of the agents studied. In contrast, however, the reaction with methanesulfonyl fluoride was generally depressed to a much smaller extent, and in two cases the reaction was speeded up by the agents being studied. These findings are of interest in connection with different requirements for the integrity of the active center in catalysis with various substrate analogs, and with the mechanism by which cationic substrate analogs accelerate the reaction of the enzyme with methanesulfonyl fluoride.

76-0429. Hosokawa, S.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Effect of subchronic feeding of sumithion, sumioxon and *p*-nitrocresol on rat hepatic oxidative phosphorylation and mixed function oxidases.** *Bochu-Kagaku (Sci. Pest. Contr.)* 40(2): 33-38; 1975. (30 references)

The subchronic effects of Sumithion (fenitrothion), Sumioxon (fenitroxon) and their derivative *p*-nitrocresol on the hepatic oxidative phosphorylation and mixed function oxidases were investigated after these compounds had been consecutively administered to male and female Wistar rats for 6 or 9 months. The chemicals were mixed into the diet at concentrations of 150 ppm Sumithion, 50 ppm Sumioxon or 1,500 ppm *p*-nitrocresol. A significant increase in the body weight and liver weight were noted only in animals receiving 1,500 ppm *p*-nitrocresol. A slight decrease of ADP:O ratios was noted in males fed 50 ppm Sumioxon and in females fed 1,500 ppm *p*-nitrocresol. However, these differences were not statistically significant. Thus it was concluded that the mitochondrial respiration system was not affected remarkably by the administration of these chemicals in vivo. The activities of aminopyrine demethylase and $NADPH_2$-cytochrome C reductase and cytochrome P-450 content showed no significant change in any group. However, enhancement of aniline hydroxylase activity was noted in males given Sumioxon. Sumithion had no effect on these parameters.

76-0430. Kadota, T.; Okuna, Y.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Acute oral toxicity and delayed neurotoxicity of 5 organophosphorus compounds, Salithion, Cyanox, Surecide, Sumithion and Sumioxon in adult hens.** *Bochu-Kagaku (Sci. Pest Contr.)* 40(2): 49-53; 1975. (10 references)

The results are presented of delayed neurotoxicity tests as well as acute toxicity tests in hens for 4 organophosphorus insecticides: Salithion, Cyanox, Surecide, and Sumithion (fenitrothion), as well as Sumioxon (fenitroxon), the active metabolite of Sumithion. The chemicals were suspended in 10% Tween 80 aqueous solution and administered p.o. by stomach tube at the rate of 1 ml/kg of the suspension to 3 or 4 groups of hens, each consisting of 4 to 6 individuals. For subacute studies Sumithion or Surecide was suspended in 10% Tween 80 aqueous solution and 1/15 and 1/30 of the acute LD50 values were administered p.o. to 8 hens/group every day for 4 consecutive weeks. The acute oral LD50 values were determined to be 110, 37.5, 60, 500, and 35 mg/kg for Salithion, Cyanox, Surecide, Sumithion and Sumioxon, resp. No compound caused delayed neurotoxicity to the surviving hens. During subacute studies no delayed neurotoxicity was noted, either. However, animals to which TOTP (TOCP, tri-*ortho*-tolyl phosphate) was administered alone as a positive control at the dosage of 300 to 500 mg/kg showed severe paralysis in the legs. Degeneration and extensive demyelination were noted in the sciatic nerves upon histopathological examination.

76-0431. Morikawa, M.; Yokoyama, S.; Fukami, J. (Lab. Insect Pharmacol., Inst. Phys. Chem. Res. Wako, Saitama, Japan). **Metabolism of chlordimeform, *N*-(4-chloro-*o*-tolyl)-*N'*,*N'*-dimethylformamidine, in rat and rice stem borer.** *Bochu-Kagaku (Sci. Pest Contr.)* 40(4): 162-184; 1975. (25 references)

The differences in the action of chlordimeform against the rat and the rice stem borer seem to be due to the differences in route and extent of degradation in these species. Rats showed more rapid uptake and excretion of

radiolabeled chlordimeform, as well as more rapid degradation than the insects. In particular, degradation of chlordimeform to *N*-(4-chloro-*o*-tolyl)- *N'*-methylformamidine (DM) and conversion from *N*-formyl- 4- chloro-*o*-toluidine (NF) to 4-chloro-*o*-toluidine (CT), as well as from CT to water-soluble products was rapid. The enzyme levels governing these reactions were quite high in the rat. All of these processes were much slower in the larva of the rice stem borer, and therefore chlordimeform and DM accumulated in the insect's body. The metabolic pattern was practically the same as in the rat.

76-0432. Lauss, F.; Danneberg, O. H. (Inst. Landwirtschaft. Pflanzensch. Forstl. Phytopathol., Hochsch. Bodenkult., Vienna, Austria). **Der Einfluss des Herbizides Pyramin auf die biologische Aktivitaet der Bodenmikroflora. [The influence of pyramin on the biological activity of the soil microflora.]** *Bodenkultur* 26(1): 22-30; 1975. (19 references) (German)

The influence of pyramin on the biological activity of the soil microflora was studied in laboratory experiments at 21-day incubation time. Chernozem with pH 7.4 and a humus content of 2.6% was used for the experiments. The decay of an easily accessible carbon source (^{14}C-labeled glucose) and a more resistant carbon source (^{14}C and ^{15}N-labeled straw), as well as the mineralization of straw nitrogen and nitrification were used as parameters. Pyramin applied in doses equal to 1,000 times the normal concentration distinctly inhibited the decay of straw, while it stimulated the decay of glucose compared with the normal dose and with controls. In the case of glucose, the normal dose of pyramin inhibited soil respiration and the mineralization of easily accessible nitrogen sources. The stimulation of the decay of the carbon source was most probably due to partial sterilization of the soil by the high pyramin level, which was then followed by an intense multiplication of the surviving microorganism. Normal doses did not interfere with nitrification, but doses equal to 100 and 1,000 times the normal concentration caused partial and total inhibition of the nitrification respectively.

76-0433. Lewis, D. L.; Paris, D. F.; Baughman, G. L. (Freshwater Ecosystems Branch, Southeast Environ. Res. Lab., U.S. Environ. Protect. Agency, Athens, GA 30601). **Transformation of malathion by a fungus, *Aspergillus oryzae*, isolated from a freshwater pond.** *Bull. Environ. Contam. Toxicol.* 13(5): 596-601; 1975. (9 references)

Aspergillus oryzae was isolated from a freshwater pond and placed in liquid basal salts medium containing malathion. Determinations of malathion and metabolites were made by thin-layer and gas-liquid chromatography. The malathion concentrations rapidly decreased in the *A. oryzae* liquid cultures, virtually all of the lost product being accounted for in the form of transformation products. The rate of malathion transformation was proportional to the dry weight of the fungal biomass. Malathion transformation for a given fungal concentration was first order with respect to malathion concentration from 0.01 to 20.0 mg/l malathion. A maximum velocity was reached at about 40 mg/l malathion and the velocity of transformation was zero order with respect to malathion in concentrations up to 90 mg/l. *V*max was 78 μg malathion/hr/mg fungus and *K*m was 16.3 mg/l malathion. In comparison with the results of bacterial studies, this data indicated that the fungal transformation of malathion yields the same major metabolites as does bacterial transformation, but the transformation rate by *A. oryzae* is much slower.

76-0434. Didier, R. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Etude du peuplement gonocytaire des ebauches gonadiques de l'embryon de Caille apres action de l'acide trichloro 2,4,5-phenoxyacetique. [Study of gonocyte population in quail embryo gonads after the action of 2,4,5-trichlorophenoxyacetic acid.]** *C. R. Seances Soc. Biol. Ses Fil.* 169(3): 574-580; 1975. (9 references) (French)

The effect of egg treatment with 2,4,5-T on the germ cell population in quail embryos was studied at different stages of incubation. The eggs were dipped into a 7 g/liter aqueous solution of 2,4,5-T for 30 sec before incubation. Relative to the controls, the germ cell count in the 2,4,5-T-treated embryos was reduced by 7.4% at stage 17 and by 12.3% at stage 18. These differences are not statistically significant according to Student's *t*-test. The reduction observed at stage 20 was statistically significant with 27.1%. The sudden drop in the germ cell count at stage 20 compared with stages 16 and 18 is due to an as yet unknown mechanism.

76-0435. Van den Driessche, J.; Le Clec'h, G.; Patay, M. (Lab. Pharmacol., Cent. Hosp. Univ., Rennes, France). **La noradrenaline et la dopamine cardiaques lors de l'intoxication aigue du Rat par un pesticide anticholinesterasique: le parathion. [Cardiac norepinephrine and dopamine levels during acute poisoning of rats with a cholinesterase-inhibiting pesticide parathion.]** *C. R. Seances Soc. Biol. Ses Fil.* 169(3): 672-675; 1975. (12 references) (French)

The cardiac norepinephrine and dopamine levels were studied in female Wistar rats poisoned with a single 16 mg/kg dose of parathion, administered through a stomach tube. Parathion caused a 35% reduction in the cardiac norepinephrine level. The reduction was 36% in animals treated with parathion and ethyl carbamate and 18% in those treated with parathion and atropine. No significant change was observed in the cardiac dopamine level. The decrease in the cardiac norepinephrine level results from the storage of acetylcholine, which also produces a slowing of the cardiac rhythm. Atropine, administered before parathion, caused an 8% increase in the heart rate.

76-0436. Warter, J.; Bieth, J.; Storck, D. (Lab. Pathol. Gen., Cent. Hosp. Univ., Strasbourg, France). **La polyserite induite par la trypsine: action du di-iso-propyl-**

fluorophosphate; evolution de l'activite proteasique des epanchements; comparaison avec l'esterase. [Trypsin-induced polyseritis: action of diisopropyl fluorophosphate; evolution of the protease activity of the effusions; comparison with elastase.] *C. R. Seances Soc. Biol. Ses Fil.* 169(3): 689-694; 1975. (6 references) (French)

Polyseritis induced by trypsin and elastase in albino rats, and the effect of diisopropyl fluorophosphate (DFP) on the trypsin protease activity was studied. Trypsin, inactivated with diisopropyl fluorophosphate by incubation for 24 hr, had no protease activity in rats after i.p. administration. Intraperitoneally injected elastase also caused polyseritis complicated by shock. At the beginning, there was more protease in the ascites fluid than in the pleural effusion, and the volume of the ascites was greater. Later, the protease content was greater in the pleural effusion, which indicates transdiaphragmatic propagation of the proteasic polyseritis.

76-0437. Virgo, B. B.; Bellward, G. D. (Div. Pharmacol., Fac. Pharm. Sci., Univ. British Columbia, Vancouver, BC V6T 1W5). **Effect of dietary dieldrin on the liver and drug metabolism in the female Swiss-Vancouver mouse.** *Can. J. Physiol. Pharmacol.* 53(5): 903-911; 1975. (42 references)

Female Swiss-Vancouver (SWV) mice, 13 weeks old, were exposed to dietary dieldrin for up to 10 weeks. Liver mass, hepatic microsomal protein and cytochrome P-450, and the in vitro metabolism of imipramine were determined at intervals. Dieldrin (5, 10, 15, and 20 ppm) caused hepatomegaly and increases in P-450; both effects were dose-related. All doses increased microsomal protein by about 30% (control value was 15.3 mg of protein per gram of liver). Maximal responses were attained by 2 weeks of exposure and maintained thereafter. Plateau liver masses at these respective doses were 111, 119, 133, and 162% of the control value (57.9 mg of liver per gram of body weight). Cytochrome P-450 was respectively 124, 142, 185, and 173% of the control value (0.93 nmol per milligram of microsomal protein). These changes decreased pentobarbital sleeping times by an average of 54% in animals fed 5, 15, or 25 ppm for 4 weeks. Similarly, the latency to the onset of anesthesia was increased by 26% at all doses. The *N*-oxidation and aryl-hydroxylation of imipramine increased with age, while demethylation decreased. The hydroxylation and demethylation of imipramine was increased after 2 and 4 weeks, respectively, of exposure to 20 ppm; *N*-oxidation was decreased. Longer exposure to lower doses caused similar changes. The changes in liver parameters and imipramine metabolism induced by 4 week exposures to 20 ppm were absent 6 weeks after exposure ceased. (Author abstract by permission)

76-0438. Shubik, P. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NB 68105). Potential carcinogenicity of food additives and contaminants. *Cancer Res.* 35(11): 3475-3480; 1975. (20 references)

The possibility of food additives and contaminants increasing the incidence of cancer in humans has been the subject of much investigation since the Second World War. Most toxicological studies of such additives have been concerned with new materials. Some problems encountered in toxicological testing are discussed. Rapid test methods included are mutagenicity testing in bacterial systems, usually with mammalian liver microsomes added, and tissue culture. Neither method can classify a compound as a carcinogen potentiallly dangerous to humans; however, either might serve as a prescreen for a manufacturer trying to choose from a series of materials. There are various types of carcinogens and it is not reasonable, from a toxicological standpoint, to class all of them together. Fluorenylacetamide, a proposed pesticide, was never used as such because testing showed that it has a wide range of potentially carcinogenic activity in a large number of species. Thiourea and thioacetamide, both used at one time as fungicides, were removed from the market. Aminotriazole (amitrole), isopropyl-*N*-phenylcarbamate (propham), and maleic hydrazide have also shown tumor-inducing capabilities in tests. Studies on DDT, aldrin, and dieldrin showed these compounds produce hepatomas. It is speculated that there is an association between enzyme induction and the occurrence of these tumors.

76-0439. Shooter, K. V. (Chester Beatty Res. Inst., Inst. Cancer Res., London, England). **Assays for phosphotriester formation in the reaction of bacteriophage R17 with a group of alkylating agents.** *Chem. Biol. Interactions* 11(6): 575-588; 1975. (40 references)

The application is described of a specific assay for chain breaks to the interaction of bacteriophage R17 with propylene oxide, DDVP (dichlorvos), β-hydroxyethyl methanesulphonate, HN2, bis-(2-chloroethyl)ether, and bis-(chloromethyl)ether. For the dichlorvos experiment, bacteriophage R17 was suspended in 0.2 *M* phosphate, pH 6.7, and dichlorvos added to give 6-100 m*M* concentrations of this reagent. Assays for survival of biological activity and for chain breaks were performed after incubating for 90 hr at 37°. The results of these experiments show some decrease in the survival of unbroken RNA chains. However, this is probably not significant since the decrease observed is not dose-related. Under the conditions of buffer and incubation time used, the mean lethal dose was about 1 m*M*. Taking the figure of 20% for the RNA chains broken at a reagent concentration of 25 m*M* shows that, at the maximum, chain breaks can account for 1 or 125 lethal events. The lack of any regular increase in the number of RNA chains broken suggest that, within the limitations of the measuring technique, methylation of the phosphate groups of RNA does not occur to any significant extent. This finding supports the earlier conclusion that the reaction between dichlorvos and nucleic acids occurs through a bimolecular SN2 mechanism.

76-0440. Suzuki, T.; Uchiyama, M. (Pharm. Inst., Tohoku Univ., Sendai, Japan). **Photoreduction of parathion**

by spinach chloroplasts. II. Ferredoxin-independent photoreduction of parathion by heated chloroplasts with an artificial electron donor system. *Chem. Pharm. Bull.* 23(10): 2290-2294; 1975. (8 references)

This paper describes the finding that parathion can be reduced independently of ferredoxin by heated chloroplasts with an artificial donor system on illumination. Parathion was reduced to hydroxylaminoparathion and aminoparathion by heated spinach chloroplasts with the artificial electron donor system in the light. The rate of reaction increased as the heating time of chloroplasts was lengthened, at least up to 3 min at 50°. Spinach ferredoxin was not required for this reaction to occur. This present photoreduction of parathion is very different from the ferredoxin-dependent one mediated by unheated chloroplasts. It is suggested that parathion accepts electrons directly from the primary electron acceptor of photosystem I in heated chloroplasts.

76-0441. Frear, D. S. (USDA Metab. Radiat. Res. Lab., State University Station, Fargo, ND 58102). **Herbicide metabolism and its significance.** *Chem. Technol.* 10: 629-632; 1975. (28 references)

The four aspects of herbicide metabolism in higher plants were studied which are most important to the continued use and development of safe and effective herbicides. Much advancement has been made concerning herbicide residues. However, even with this rapid progress, knowledge of the metabolism of many herbicides in plants is incomplete, particularly in the area of terminal polar metabolites and insoluble residues. What these terminal plant residues do in the environment is largely unknown. Concerning plant biochemistry, little effort has been made to assess the behavior of foreign compounds, particularly drugs, in plants. Such studies abound for animals. Recent studies have shown that several key enzymes in plants detoxify herbicides and as such these studies have offered valuable insight into pesticide interactions, biosynthesis, and isolation and identification of metabolites. Concerning the mechanism of herbicides' action, many studies have exhibited narrow concern, limited to significance of herbicide metabolism and the formation of phytotoxic metabolites.

76-0442. Rozman, K.; Mueller, W.; Iatropoulos, M.; Coulston, F.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen-Umweltforsch. mbH, Munich, Germany). **Ausscheidung, Koerperverteilung und Metabolisierung von Hexachlorbenzol nach oraler Einzeldosis in Ratten und Rhesusaffen. [Separation, excretion, and metabolism of hexachlorobenzene after single oral doses in rats and Rhesus monkeys.]** *Chemosphere* 4(5): 289-298; 1975. (5 references) (German)

The excretion, distribution, and metabolism of ^{14}C-labeled hexachlorobenzene (HCB) were studied in male and female rats and Rhesus monkeys during 40 days after the oral administration of a single dose (0.4-0.6 mg/kg body weight to rats and 0.5 mg/kg to monkeys). There were no significant differences between males and females regarding the elimination and distribution pattern, but urinary excretion seemed to be higher in females than in males. The total urinary excretion was 30.3-36.1% in rats and 12.4-29.9% in monkeys. The excretion in feces amounted to 28.9-35% in rats and 9.8-28% in monkeys. Hexachlorobenzene and its metabolites were stored mainly in the fat, thymus, adrenal glands, lymph nodes, gall bladder, and bone marrow both in rats and in Rhesus monkeys. The hexachlorobenzene levels in the fat and thymus were between 0.9 and 1.8 ppm. Pentachlorobenzene, pentachlorophenol, and trace quantities of tetrachlorobenzene were identified as the metabolites of hexachlorobenzene. In rats, the metabolite level in the urine was below the detection limit. Rat feces contained 3.2-3.9% pentachlorobenzene. After 40 days, 51.4-62.1% of the hexachlorobenzene and 37.9-48.6% of the pentachlorobenzene were found in the liver. Urine samples from Rhesus monkeys contained 0.4-0.8% of the radioactivity in the form of pentachlorobenzene and 1-1.2% of the radioactivity in the form of pentachlorophenol. Fecal samples contained 1-1.2% of the radioactivity from pentachlorobenzene and 0.2-0.3% from pentachlorophenol. The overall rate of metabolism in monkeys was 2.6% in males and 3.5% in females. After 40 days, 56.8-66.9% of the radioactivity was found in the liver in the form of hexachlorobenzene and 33.1-43.2% in the form of pentachlorobenzene. The half-life of hexachlorobenzene was determined to be 3-4 months in rats and 2.5-3 yr in Rhesus monkeys.

76-0443. Schuphan, I.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanstalt, Berlin, Germany). **Zum Metabolismus von Phenylharnstoff-Herbiziden. V. Metabolismus von hydroxyliertem Monolinuron in Spinat. [Metabolism of phenylurea-derived herbicides. Part V: Metabolism of hydroxylated monolinuron in spinach.]** *Chemosphere* 4(5): 307-310; 1975. (5 references) (German)

The metabolism of hydroxylated monolinuron (3-(4-chlorophenyl)- 1-methoxy -1- hydroxymethylurea) was studied in roots and sprouts of 18-day-old spinach plants after fractionated application of 3 mg of hydroxylated monolinuron per Petri dish. Thin-layer chromatographic examinations revealed three distinct metabolites: 3-(4-chlorophenyl)- 1-methoxyurea, formed after the cleavage of formaldehyde; 4-chlorophenylurea, formed after elimination of the methoxy group; and the glycoside, formed through the stabilization of hydroxylated monolinuron as a result of conjugation with glucose. Hydroxylated monolinuron was no longer detectable in the plants. The findings indicate that hydroxylated monolinuron plays a key role in the metabolism of monolinuron.

76-0444. Sundstrom, G.; Jansson, B. (Environ. Toxicol. Unit, Wallenberg Lab., Univ. Stockholm, S-104 05 Stoc-

kholm, Sweden). **The metabolism of 2,2′,3,5′,6-pentachlorobiphenyl in rats, mice and quails.** *Chemosphere* 4(6): 361-369; 1975. (19 references)

The structure of the metabolites excreted by rats, mice, and quail was examined after administration of 2,2′,3,5′,6-pentachlorobiphenyl. The chemical was given to the animals in peanut oil solution, at about 20 mg/ml. Rats and mice were allowed to ingest the solution freely. Quail were given the solution (0.5 mg/animal) by stomach tube. A comparison of the chromatograms of the derivatized metabolites from the three animal species studied showed that a certain difference in metabolic pattern exists between the bird and the mammals. The major monophenol excreted by the quail is a *para*-hydroxy compound formed by hydroxylation in the less highly substituted phenyl ring. The major component excreted by the rats and mice is a *meta*-hydroxy compound, hydroxylated on the most highly substituted ring. The results of this study support the recent assumption concerning the difference in metabolism between birds and mammals based on a study of the different chlorobiphenyl patterns in guillemot and seal from the Baltic. Since both organisms feed on chlorobiphenyl-containing herring the differences in chlorobiphenyl composition in their tissues may reflect different metabolic pathways.

76-0445. Sram, R. J.; Bencko, V. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Prispevek k hodnoceni genetickcho rizika expozice arzenu. [A contribution to the evaluation of the genetic risk of exposure to arsenic.]** *Cesk. Hyg.* 19(6-7): 308-315; 1974. (14 references) (Czech)

The genetic risk from exposure to arsenic was studied. For acute studies, arsenic (250 mg/kg, p.o.) was given to mice. For chronic four-generation administration studies, sodium arsenite was added to the drinking water of male mice for 8 weeks at concentrations of either 10 or 100 mg/l from the time of weaning. At the end of this exposure period the males were mated with females and the F_1-F_3 generations were obtained. Some males of the F_3 generation exposed to 10 and 100 ml/l of sodium arsenite were given a dose of TEPA (1 mg, i.p.) before mating. The difference in the frequency of dominant lethals induced by a standard mutagen, TEPA, and TEPA in combination with arsenic was estimated. A significant increase in the frequency of mutations was noted in the group having combined administration of 100 mg As and 1 mg TEPA/kg as compared with the group receiving 1 mg TEPA/kg. It is suggested that the arsenic inhibited the enzymes responsible for repairing genetic damage. It is concluded that arsenic is a substance of potential genetic risk due to its ability to affect the repair mechanism of genetic damage.

76-0446. Kalac, J. (Dep. Hyg., Inst. Farm., Bratislava, Czechoslovakia). **The effect of organophosphorus compounds on the activity of some digestive enzymes.** *Cesk. Hyg.* 19(8): 355-362; 1974. (28 references)

A study was conducted on the effect of organophosphorus compounds on the activity of some digestive enzymes in two species of Atlantic fish: herring (*Clupea harengus* L.) and capelin (*Mallotus villosus* L.). The pyloric ceca proteinases were isolated and partly purified from these two species. *Clupea harengus* proteinases consisted of 6 enzymatically active fractions, 4 of which possessed specific trypsin activity and 2 possessed chymotrypsin activity. Capelin pyloric ceca proteinases consisted of 3 enzymatically active fractions, 2 of which belong to trypsin and the third possesses chymotrypsin activity. The addition of organophosphorus pesticides into the water caused a partial inhibition of the proteolytic activity. Addition of parathion, metathion (fenitrothion), and malathion in concentrations ranging from 80 p*M* to 20 μM inhibited the trypsin activity. Of the individual isozymes of trypsin, the most sensitive to the action of organophosphorus compounds was trypsin 4. There was a correlation between the inhibiting effects of these pesticides and their toxicity.

76-0447. Schulze, H.; Gehrmann, J. (Inst. Wildtierforsch. Hannover, Ahnsen, Germany). **Modellversuche an Fasanen mit je 1 Insktizid (Lindan), 1 Herbizid (Terbutryn), 1 Mineralduenger (Kalkammonsalpeter) und 1 Fungizid (HCB). IV. Mitteilung (Lindan). [Model experiments in pheasants with an insecticide (lindane), a herbicide (terbutryne), a mineral fertilizer (calcium ammonia salpeter) and a fungicide (HCB). IV. Communication (lindane).]** *Dtsch. Tieraerztl. Wschr.* 82(6): 235-237; 1975. (15 references) (German)

The effect of lindane on the hepatic vitamin A level was studied in pheasants fed Nexit-treated grain at a daily dose of 3.3 mg/animal for 7 to 35 days. Lindane appeared to have no significant effect on the vitamin A level in the liver as the initial reduction of the vitamin A level was most probably due to the reduced appetite of the animals. The findings indicate that if applied according to instructions, lindane is not hazardous for game.

76-0448. Hsu, T. S. (Rutgers-The State University, New Brunswick, NJ). **Formation and biodegradation of pesticide-derived chloroaniline-humus complexes in soil and in culture solution.** *Diss. Abstr. Int.* 36(5): 2072B; 1975.

The chemical attachment of chloroanilines to humic substances occurs in at least two manners, hydrolyzable and nonhydrolyzable. In the first case, binding occurs in form of anils and anilinoquinones; in the second the probable binding mechanism involves heterocyclic ring closures. In the test soil (Nixon sandy loam) these two types of binding mechanisms immobilized roughly equal amounts of chloroanilines. Free radical mechanism has little or no role in these reactions. The binding of chloroanilines to the soil organic matter greatly increases the persist nce of these herbicide residues in the environment. Experiments with soil-bound radiolabeled 3,4-dichloroaniline demonstrate that $^{14}CO_2$ is released from soil at the rate of one percent per week. The rate of $^{14}CO_2$

release was not significantly influenced by variations of pH from 5.0 to 8.0, and moisture contents between 50% and 70% of the holding capacity. Small amounts of glucose (30 mg per 50 g soil) did not influence $^{14}CO_2$ release, but large amounts (250 mg per 50 g soil) severely inhibited the release of radiocarbon. The temperature optimum for $^{14}CO_2$ release was found to be 37°C. Sterilized and anaerobic soils released less than 4% of $^{14}CO_2$ as compared to the non-sterile aerobic control. The overall rate of microbial activity as measured by total CO_2 evolution was not significantly affected by humus-bound 3,4-dichloroaniline. Biodegradation of the humic-3,4-dichloroaniline complex by two soil fungi was studied using this complex as the only organic substrate in a mineral salts solution. *Penicillium frequentans* in two weeks released 7,300 μmol of total CO_2, but only 0.5% of the radiocarbon. In contrast, *Aspergillus versicolor* released 4,700 μmol of total CO_2, but as much as 1.3% of the radiocarbon. Analyses of the residual humic acid complex and its metabolites indicate two distinct modes of attack by the two soil fungi. The hydrolyzable and hence analytically accessible portion of the bound residues declines with time, while the nonhydrolyzable portion does not, or does so only at a much slower rate. The shifting ratio of hydrolyzable versus nonhydrolyzable chloroaniline-humus complexes frustrates current attempts to assess the true chloroaniline burden of phenylamide herbicide-treated soils. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-24,697.)

76-0449. Fitzpatrick, G. (Rutgers-The State Univ., New Brunswick, NJ). **Impact of temephos (*sic*) and other mosquito larvicides on the salt marsh snail *Melampus bidentatus* Say (Basommatophora:Ellobiidae).** *Diss. Abstr. Int.* 36(5): 2045B-2046B; 1975.

The impact of the organophosphorus insecticides temophos, chlorpyrifos, fenthion, and malathion on the salt marsh snail *Melampus bidentatus* Say was studied in laboratory and field experiments, the latter in salt marsh plots on the New Jersey coast. No significant effects were observed on the population density of *M. bidentatus* in plots treated with granular chlorpyrifos and temophos. However, a significant depression in population density was observed in plots subjected to multiple treatments with a temophos emulsion. This depression was followed by a resurgence to pretreatment levels 3 weeks after the last treatment. Changes in age structures of the snail populations, observed in all treatment plots, suggested an age specific insecticide effect along with recruitment of snails from outside of treated plots. Measurable amounts of temophos were taken up within one day after the first treatment with a granular formulation; uptake from emulsion treatments was slower. Residues in snails with the emulsion treatments also declined more rapidly than after granular treatment. Prolonged (more than 5 weeks) detection of temophos residues in *M. bidentatus* suggests the potential for movement of this insecticide through food webs when granular formulation is used. Temophos, malathion, and fenthion did not prove highly toxic to adult *M. bidentatus* in laboratory tests. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-24,686.)

76-0450. Moore, R. N. (Univ. Rochester, Rochester, NY). **Adrenocortical carcinoma 494: fine structural and biochemical studies following aminoglutethimide and *o,p'*-DDD therapy in the rat.** *Diss. Abstr. Int.* 36(5): 2006B-2007B; 1975.

A transplantable rat adrenocortical carcinoma was used to study the morphological, biochemical, and physiological effects of two clinically employed chemotherapeutic agents, aminoglutethimide and *o,p'*-DDD, on the tumor and the host's adrenocortices. Administration of *o,p'*-DDD to normal and tumor-bearing animals resulted in an initial weight loss and subsequent retardation of the rate of body weight increase. Compared to sham-treated tumor-bearing animals with identically sized tumors, neoplasm growth was also diminished during active therapy, but proliferation increased during recovery periods. Relative adrenal weight was increased in both groups during active therapy. Morphologically, adrenocortical mitochondria were virtually devoid of internal membranes and SER decreased. Although lipid was increased stereologically, there was no change of cholinesterol or cholesterol ester. Decreases in both DNA and RNA were in keeping with morphologically observed cellular atrophy. In the tumor of *o,p'*-DDD-treated rats, mitochondria exhibited an electron lucent matrix and decreased numbers of cristae. Stereologically, while the volume fraction of nuclei was decreased, there was a significant increase in necrotic cells at 14 days of continuous therapy. Plasma corticosterone levels were reduced during tumor chemotherapy with *o,p'*-DDD, but no other biochemical changes were evident. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-24,464.)

76-0451. Grant, D. L.; Iverson, F.; Hatina, G. V.; Villeneuve, D. C. (Food Res. Lab., Health Protection Branch, Natl. Health and Welfare, Ottawa, Ontario, Canada). **Effects of hexachlorobenzene on liver porphyrin levels and microsomal enzymes in the rat.** *Environ. Physiol. Biochem.* 4(4): 159-165; 1974. (31 references)

Two experiments were carried out to determine the effects of long-term administration of HCB on a number of biochemical parameters. Sprague-Dawley male and female rats were fed ground stock cubes containing 0, 10, 20, 40, 80, and 160 ppm HCB from weaning for 9 or 10 months. A dietary concentration of 20 ppm is about equal to 1 mg/kg body weight. HCB residues in the liver were dose related and levels were not dependent on the sex of the rat. The liver:body weight ratios were increased in both sexes fed the 80 and 160 ppm diets. Weight gains of the females fed dietary levels of 80 and 160 ppm HCB were

reduced. In males fed 40 ppm or more HCB, in vitro hepatic aniline hydroxylase and *N*-demethylase activities and cytochrome P-450 levels were increased. However, these same activities were unaltered in females fed all dietary levels of HCB. The pharmacological action of pentobarbital and zoxazolamine were shortened in male and female rats fed 20 ppm or more HCB. Female rats acquired chemical porphyria readily. Male rats were resistant.

76-0452. Powers, C. D.; Rowland, R. G.; Michaels, R. R.; Fisher, N. S.; Wurster, C. F. (Marine Sci. Res. Cent., State Univ. New York, Stony Brook, NY 11794). **The toxicity of DDE to a marine dinoflagellate.** *Environ. Pollut.* 9(4): 253-262; 1975. (36 references)

A study was made of the effects of DDE on natural marine phytoplankton populations at concentrations approximating those of total chlorinated hydrocarbons found in nature. *Exuviella baltica*, a dinoflagellate, was used for the study. The results of the study indicated that DDE is highly toxic to *Exuviella baltica*. Concentrations as low as 0.1 ppb significantly inhibited growth for at least 24 hr. Thereafter, growth rates in 0.1 ppb-treated cultures slightly exceeded controls, but cell numbers remained lower than controls for 3 or 4 additional days. When exposed to higher concentrations of DDE, 1 to 10 ppb, the inhibition was increased. The extent and duration of the inhibition was dependent on dose. Cell numbers doubled only once in 7 days at the dose of 10 ppb. In control cultures the cells doubled 6 times in the same period. DDE was found to be more toxic than DDT or polychlorinated biphenyls. An additive effect was noted between the inhibitions caused by DDE and polychlorinated biphenyls in combination. It was estimated that the lowest cellular concentrations of DDE found in this study were from 2 to 13 times the concentrations of total chlorinated hydrocarbons found in samples from natural marine phytoplankton communities. Considering the worldwide distribution of *E. baltica*, the importance of members of the genus as primary producers, and the selective feeding upon dinoflagellates by copepods, it is suggested as possible that chlorinated hydrocarbon pollutants such as DDE could influence the availability of food for herbivores in regions where *E. baltica* or other sensitive organisms prevail.

76-0453. Peakall, D. B. (Sect. Ecol. Systematics, Cornell Univ., Ithaca, NY 14853). **Blood calcium levels and the mechanism of DDE-induced eggshell thinning.** *Environ. Pollut.* 9(4): 289-294; 1975. (19 references)

Studies were conducted to further understand the mechanism by which DDE causes eggshell thinning. Experimental ring doves (*Streptopelia risoria*) were fed 100 ppm DDE for 3 weeks. Experimental white Pekin ducks (*Anas platyrhynchos*) were fed 250 ppm DDE for 10 days. About 2 months after DDE dosing, the ducks began laying. DDE-fed birds of both species laid eggs which were significantly (35%) thinner than controls. Blood calcium was not affected by DDE feeding in either ring doves or white Pekin doves. It is suggested from these results that DDE may act directly in the shell gland, inhibiting a cellular calcium pump.

76-0454. Sato, N.; Ota, M.; Murata, Y.; Obara, K. (Dep. Biochem., Iwate Med. Univ. Sch. Med., Morioka, Japan). **The effect of pesticides on hydroxylation of testosterone in hepatic microsomes of rabbits.** *Experientia* 31(10): 1193-1194; 1975. (9 references)

Ethylmercuric phosphate (EMP, 0.05 mg/kg), *O,O*-dimethyl-*O*-(3-methyl-4-nitrophenyl) thiophosphate (MEP, fenitrothion 0.5 mg/kg), and BHC (1.5 mg/kg) in corn oil were given orally every other day for 5 mo to adult male rabbits. Controls were given saline solution or corn oil. The animals were then sacrificed and the hepatic microsomes suspended in Krebs-Ringer buffer with NADPH and ^{14}C-labeled and unlabeled testosterone. The mixture was incubated at 37°C for 30 min. The cytochrome P-450 content was reduced to about 80% of control values in the BHC- and EMP-treated rabbits and to about 60% of control values in the MEP-treated rabbits. The amount of unmetabolized testosterone was higher and the formation of hydroxytestosterones per mg protein or per mg cytochrome P-450 was lower in the preparations from the pesticide-treated animals than in those from the controls. The decrease in hydroxylase activity was due to other factors in addition to the decrease in cytochrome P-450. In general, pesticides appear to have inhibitory effects on the metabolism of drugs and steriods by helpatic microsomes.

76-0455. Tomatis, L.; Turusov, V. (Internatl. Agency Res. Cancer, Lyon 69008, France). **Studies on the carcinogenicity of DDT.** *GANN Monograph Cancer Res.* 17: 219-241; 1975. (58 references)

This monograph reviews the results of carcinogenicity studies on DDT performed in Milan at the International Agency for Research on Cancer. Studies conducted for possible carcinogenicity of DDT in mice indicated that lifetime exposure to technical DDT caused a high incidence of hepatomas in males at concentrations of 2, 10, 50, and 250 ppm, and in females at a concentration of 250 ppm; that DDT-induced hepatomas only rarely metastasize and usually do not show signs of invasiveness, but could, in mice exposed to 250 ppm DDT, be related to a considerable shortening of life; that the capacity of DDT to induce liver tumors is dose related and is also dependent on the duration of the administration period; that the persistence of DDT-induced hepatomas does not require continuous administration of DDT; that after treatment with DDT has ceased, the induced tumors continue to grow; and that with lifetime exposure, one of the two main DDT metabolites, DDE or DDD (TDE), causes a high incidence of lung tumors. Long term studies carried out in other animal species indicate a borderline carcinogenic effect of DDT in rats and no effect in hamsters. The studies on man which are available are very few, the number of people too small, and the periods of observation too short to allow any

conclusions regarding a possible carcinogenic effect of DDT in man.

76-0456. Beattie, K. L.; Kimball, R. F. (Univ. Tennessee-Oak Ridge Grad. Sch. Biomed. Sci. and Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN). **Involvement of DNA replication and repair in mutagenesis of *Haemophilus influenzae* induced by *N*-nitrosocarbaryl.** *Genetics* 77(1 pt 2): S3-S4; 1974.

N-Nitrosocarbaryl was used to treat a temperature-sensitive DNA synthesis mutant of *H. influenzae* (strain *dna* 9) which was then incubated in growth medium at 36° and 41° temperatures. Lysates were made at various times and used to transform a second culture to mutant phenotype (novobiocin resistance). Measured as an increase in the ability of lysates to produce novobiocin-resistant mutants through transformation, at 36°, "mutation fixation" continued for at least half of the first round of RNA replication after treatment. At 41° most of the mutation fixation was eliminated. It is indicated by the data that the bulk of the mutation fixation requries DNA replication. However, it is also evident that a process independent of replication, possibly an error-prone repair system, is also responsible for part of the mutation fixation in cells exposed to alkylating agents. The incubation of mutagen-treated strain *dna* 9 at 41° for a time before growth at 36° caused a large decrease in the final mutation frequency, suggesting that a repair mechanism still functional in the absence of DNA replication can remove premutational lesions from the DNA of *H. influenzae*. The non-replicative component of mutation fixation occurs normally in the recombination defective strain *rec* 1, whereas most mutations fixed during replication disappear at later times. Repair of premutational lesions and mutation fixation in the absence of replication are normal in a mutant defective in the excision of pyrimidine dimers. This is also noted in a UV-sensitive mutant that is slow in rejoining gaps formed during excision.

76-0457. Davring, L. (Inst. Genet., Univ. Lund, S-223 62 Lund, Sweden). **Effects of a 2,4,5-T ester on early oogenesis, fertility and development in *Drosophila melanogaster*.** *Hereditas* 80(2): 255-262; 1975. (10 references)

Acute toxicity to adult female flies, effect on fertility, and effects on developmental time from laid egg to eclosed fly were determined for a commercial product of a 2,4,5-T butoxyethyl ester. The experiments were conducted using a wild-type population of the Canton-S_{109} strain, *Drosophila melanogaster*. The LD50 value of the 2,4,5-T compound was calculated to be 4030-5380 ppm. For analysis of the fertility of flies living on different doses of 2,4,5-T, 24 hr old adults were fed on wheat-agar medium mixed with 0, 50, 100, 250, and 500 ppm 2,4,5-T for 4 days. A decrease was noted in the oviposition by the treated females, which may reflect disturbances in oogenesis and/or aversion to lay eggs in the poisoned medium. Total time of development was significantly prolonged in treated groups, causing somatic effects in emerged flies. Such effects may in part be due to alterations in the rate of gene-controlled reactions and thus result in different phenotypes. A few flies with teratogenic effects were noted. Studies showed that in treated females, the ovaries develop fewer egg follicles and/or develop fragile egg follicles which are destroyed during preparation. More drastic effects such as empty egg follicle sacks were noted from flies in the 250 ppm than in the 1 ppm medium. It is noted that the results of this study show not only the effects of the 2,4,5-T on the tested species, but also the effects of other components in the 2,4,5-T butoxyethyl ester, such as the emulsifying agent and the solvent. However, statistical analysis of the findings of this study confirm that the 2,4,5-T product tested is harmful to the oogenesis of the flies, that it is more harmful if it is given from eclosion rather than later in life, and that there exists a dose effect, at least in certain situations.

76-0458. Rao, T. S.; Rao, M. S.; Prasad, S. B. S. K. (A. U. Coll. Eng., Waltair, India). **Median tolerance limits of some chemicals to the fresh water fish "Cyprinus carpio".** *Indian J. Environ. Health* 17(2): 140-146; 1975.

A series of experiments was conducted using the bio-assay technique to establish median tolerance limits (TLm) of toxic chemicals which are generally used in agriculture and other industrial operations. The insecticides evaluated in these experiments included dieldrin 15% EC, aldrin 30% EC, and chlordane 75% EC. Carp, of the family "Cyprinidae" and scientifically named *Cyprinus carpio*, were used as test animals. Dieldrin and aldrin administration excited the fish, resulting in jerky movements. Then the fish lay on their sides and sank slowly to the bottom. Death followed. With chlordane, the fish showed excitation followed by loss of coordination of movements. Jerky movements and partial loss of equilibrium were noted. Finally, they lay on their backs and died. Chlordane was more highly toxic than aldrin and dieldrin.

76-0459. Joshi, H. C.; Kapoor, D.; Panwar, R. S.; Gupta, R. A. (Central Inland Fisheries Res. Substation, Allahabad, India). **Toxicity of some insecticides to Chironomid larvae.** *Indian J. Environ. Health* 17(3): 238-241; 1975. (5 references)

Bioassays were performed on 5 organic biocides to determine their relative toxicity to Chironomid larvae, an important benthic organism and fish food, particularly to bottom feeding fishes such as *Mystus* sp., *Cyprinus carpio*, *Tilapia mossambica*, etc. Two organophosphorus biocides, malathion and rogor (dimethoate), and three organochlorine biocides, endrin, DDT, and γ-BHC (lindane), were evaluated. A marked difference was noted in the behavior of the larvae after exposure to organochlorine biocides compared to organophosphates. After exposure to organochlorine biocides the red color of the larvae paled considerably after 24 hr exposure whereas no such change

was noted in the latter case. Among the organochlorine biocides, endrin was the most toxic. Among the organophosphorus biocides, malathion is slightly more toxic than rogor. Chironomid larvae are the least susceptible to DDT and their susceptibility to other biocides increased in the order DDT, rogor, γ-BHC, malathion, and endrin.

76-0460. Vos, J. G.; Moore, J. A. (Environ. Biol. Chem. Branch, Natl. Inst. Environ. Health Sci., Natl. Inst. Health, Research Triangle Park, NC). **Suppression of cellular immunity in rats and mice by maternal treatment with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Int. Arch. Allergy Appl. Immunol.* 47(5): 777-794; 1974. (40 references)

Treatment of female F-344 rats and C57Bl/6 mice with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD, 5 μg/kg/day by gastric intubation) during the latter half of gestation and in the postnatal period resulted in a severe depletion of lymphocytes in the thymic cortex of the offspring. Cellular immunity was impaired in these animals, allograft rejection times being prolonged in both species. The graft-versus-host (GVH) activity of the spleen cells as well as the response of rat thymus and spleen cells to phytohemagglutinin (PHA) was also reduced on a cell-for-cell basis. No reduction occurred in the response of the thymic cells to concanavalin A (Con A). Maternal treatment on days 0, 7, and 14 after parturition (5 μg/kg TCDD) reduced the total PHA and Con A response recoverable from the thymus by 91 and 74%, respectively. Histologically, depletion of the thymic cortex was not due to lymphocyte destruction, and there was no adrenal hypertrophy. Stress-induced release of glucocorticoids was not considered responsible for the immune suppression observed. In contrast to the marked effects in early life, the reduced responsiveness of the spleen cells to PHA in mice treated with TCDD when 1 mo old was seen only at a dose level which was clearly toxic. In 4-mo-old mice, neither PHA responsiveness nor GVH activity was decreased. The response of unstimulated and stimulated thymus and spleen cell cultures was not reduced by adding TCDD in vitro. In the TCDD-exposed rats, decreased eosinophilia was observed in the acidophilic cells of the adenohypophysis.

76-0461. Shapiro, M. S.; Gutman, A.; Bruderman, I.; Myers, B.; Griffel, W. B. (Dep. Med. C, Meir Hosp., Kfar Saba, Israel). **Cushing's syndrome associated with a bronchial adenoma.** *Isr. J. Med. Sci.* 11(9): 919-924; 1975. (18 references)

The diagnostic and therapeutic problems in a patient with the ectopic ACTH syndrome caused by a malignant bronchial adenoma are discussed. Findings in a 38-yr-old male porter included the appearance of a suprarenal mass on retroperitoneal insufflation, a lack of glucocorticosteroid suppresion with dexamethasone, and a low circulating ACTH concentration. Both adrenal glands were excised and the histologic findings together with plasma ACTH levels of over 300 pg/ml suggested the ectopic ACTH syndrome. The patient refused to undergo thoractomy. Therapy with *o,p'*-DDD, 1-3 gm/daily, was then started and a good therapeutic response was obtained. However, the patient refused to continue this treatment because of drug-induced anorexia and somnolence. Excision of the bronchial adenoma alleviated the hypercortisolism.

76-0462. Haque, R.; Deagen, J.; Schmedding, D. (Office Pestic. Programs, Criteria Eval. Div., Environ. Protect. Ag., Washington, DC 20460). **Binding of 2,4-dichloro- and 2,4,5-trichlorophenoxyacetic acids to bovine serum albumin. A proton magnetic resonance study.** *J. Agric. Food Chem.* 23(4): 763-766; 1975. (8 references)

The binding of two important herbicides, 2,4-dichloro- and 2,4,5-trichlorophenoxyacetic acids (2,4-D and 2,4,5-T), with the protein bovine serum albumin has been studied. The use of the proton magnetic resonance technique to study protein-herbicide binding has been demonstrated. The line widths of methylene and ring protons of 2,4-D and 2,4,5-T showed an increase upon the addition of bovine serum albumin (BSA). These changes have been interpreted in terms of binding of BSA. These studies suggest that the methylene protons are closer to the binding site than the ring protons. The equilibrium constant for the binding process has been determined. The binding shows a decrease with increasing pH. (Author abstract reprinted by permission of the American Chemical Society).

76-0463. Holm, R. E.; Chin, W. T.; Wagner, D. H.; Stallard, D. E. (Diamond Shamrock Corp., T. R. Evans Res. Cent., Painesville, OH 44077). **Metabolism of thiofanox in cotton plants.** *J. Agric. Food Chem.* 23(6): 1056-1060; 1975. (11 references)

Acid-delinted cottonseeds were treated with 0.5% (w/w) [^{35}S]- or [*N-Me*-^{14}C]thiofanox (P), 3,3-dimethyl-1-(methylthio)- 2-butanone *O*-[(methylamino) carbonyl]oxime before planting. This insecticide was readily taken up by the young seedlings and translocated to the cotyledons and developing leaves where it was rapidly metabolized to its sulfoxide (P_1), 3,3-dimethyl-1-(methylsulfinyl)- 2-butanone *O*-[(methylamino) carbonyl]oxime. The level of P_1 declined in the cotton leaves with time resulting in the formation of the sulfone (P_2), 3,3-dimethyl- 1-(methylsufonyl)- 2-butanone *O*-[(methylamino) carbonyl]oxime, and water-soluble metabolites. Cottonseeds from laboratory and field plants grown from thiofanox-treated seeds contained less than 5 ppb of carbamate residues. (Author abstract reprinted by permission of the American Chemical Society)

76-0464. Scales, E. H.; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762). **Endrin uptake in insecticide-resistant and susceptible mosquitofish (*Gambusia affinis*).** *J. Agric. Food Chem.* 23(6): 1076; 1975. (13 references)

Insecticide-resistant and susceptible mosquitofish were exposed to 10 and 1500 ppb of endrin. Brain, liver, and muscle tissue concentrations of [^{14}C]endrin were compared based on time of endrin exposure and whether fish were exhibiting symptoms of insecticide poisoning (symptomatic) or not exhibiting symptoms of insecticide poisoning (asymptomatic) at the time of sampling. Within each population there was a direct relationship between symptoms of poisoning and tissue concentrations of endrin. Insecticide-resistant fish generally showed lower endrin concentrations than susceptible fish except when both populations were exhibiting symptoms of poisoning. This lower concentration of endrin suggests a membrane barrier that is more effective in the resistant than in the susceptible fish. The higher concentrations of endrin in asymptomatic than in symptomatic susceptible fish are suggestive of a less sensitive target site in the more insecticide tolerant susceptible fish. This same pattern was seen when analogous comparisons for resistant fish were made. The data indicates a significant difference in endrin uptake between resistant and susceptible fish and suggests a target site that is less sensitive to endrin as a factor in insecticide resistance in mosquitofish. (Author abstract reprinted by permission of the American Chemical Society).

76-0465. Hill, J. E.; Krieger, R. I. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Uptake, translocation, and metabolism of tirpate in tobacco, *Nicotiana tabacum*.** *J. Agric. Food Chem.* 23(6): 1125-1229; 1975. (7 references)

[^{14}C]Tirpate [(2,4-dimethyl- 1,3-dithiolane-2-carboxaldehyde *O*-(methylcarbamoyl) oxime] was administered to young tobacco *Nicotiana tabacum* plants in hydroponic culture. The radiolabel was rapidly taken up and translocated throughout the shoot. Young leaves sampled 12 days following treatment were labeled less heavily than older leaves indicating that the Tirpate and its metabolites were not rapidly retranslocated. Tirpate and three major metabolites were extracted with organic solvent and were chromatographed by silica gel TLC. The half-life of Tirpate in the plant was 8-9 hr. The first metabolite was identified as Tirplate sulfoxide. The lyophilized aqueous fraction was hydrolyzed with acid, glucosidase, and sulfatase. Water-soluble conjugates were quantitated but not identified. (Author abstract reprinted by permission of the American Chemical Society).

76-0466. Frerichs, W. M.; Holbrook, A. A.; Allen, P. C. (Anim. Parasitol. Inst., Agric. Res. Serv., U.S. Dep. Agric., Beltsville, MD 20705). **Effect of antiparasitic medication in ponies on pasture.** *J. Am. Vet. Med. Assoc.* 168(1): 53-56; 1976. (12 references)

Twenty Shetland ponies, 6 to 7 months old, were naturally infected with gastrointestinal nematodes and stomach bots. The ponies were alloted to 2 groups of 10 and were maintained on separate similar pastures that were free of infective larvae at the beginning of the study. The ponies in 1 group were treated monthly for 17 months with a therapeutic dose of a thiabendazole and piperazine mixture; those in the other group were not treated. During the 3rd and 5th months of the experiment, the ponies in the treated group were also given therapeutic doses of dichlorvos to remove bots. Various physical, hematologic, parasitologic, and blood chemical observations were made at weekly intervals. Each group on ponies was weighed at biweekly intervals. At the end of the experiment, the greatest differences between the treated and control ponies were in the mean number of worm eggs in fecal samples (0 vs. 1,866 eggs/g), mean body weight (151.9 vs. 117.0 kg), mean heart girth (126.5 vs. 116.3 cm), mean packed cell volume (36.4 vs. 30.8%), and mean serum protein content (8.47 vs. 9.33 mg/100 ml), especially β-globulin content (mean of 1.9 vs. 3.4 mg/100 ml). The treated ponies remained clinically normal and were more spirited and more difficult to restrain for blood sampling and weighing than were the untreated controls. Parasitic nematode larvae were not recovered from grass samples from the pasture grazed by the treated ponies, but many such larvae (up to 500/300-g sample) were recovered from grass samples from the pasture grazed by the untreated ponies. (Author abstract by permission)

76-0467. Pedersen, L. G.; Carlson, G. L. (Dept. Chem., Univ. North Carolina, Chapel Hill, NC 27514). **The planarity of hexachlorobenzene: An *ab initio* investigation.** *J. Chem. Phys.* 62(5): 2009-2010; 1975. (10 references)

The conformation of hexachlorobenzene was investigated by *ab initio* quantum mechanical calculation. These calculations support a planar structure. The hexachlorobenzene molecule has considerable pharmacological interest. Many cases of porphyria have been experienced in Turkey when wheat sprayed with hexachlorobenzene, used as a fungicide, was accidentally converted to food products. One possible mechanism of its action is that hexachlorobenzene forms a complex with one of the several porphyrin compounds in the heme biosynthetic pathway of the liver. The size of the porphyrin ring and the hexachlorobenzene molecule are very similar. The flat nature of both and the high polarizability of each could lead to a considerable van der Waals interaction.

76-0468. Johnson, J. C., Jr.; Jones, R. L.; Leuck, D. B.; Bowman, M. C. (Dep. Anim. Sci., Georgia Coastal Plain Exp. Stn., Tifton, GA 31794). **Persistence of chlorpyrifos-methyl in corn silage and effects of feeding dairy cows the treated silage.** *J. Dairy Sci.* 57(12): 1467-1473; 1974. (6 references)

Corn was sprayed in the field at dent stage of maturity with chlorpyrifos-methyl [*O*, *O*,-dimethyl *O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate] at .56, 1.12, and 2.24 kg per hectare, ensiled 1 day later, and

methodology for detection of residues was developed. Losses of total residues (chlorpyrifos-methyl) and its pyridinol hydrolysis product) through 83 days of ensiling were equivalent to 55, 71, and 76% of that applied. Beginning 83 days post ensiling, control and treated silages were fed to 16 cows, 4 per treatment, for 42 days during which chlorpyrifos-methyl averaged .35, .87, and 1.85 ppm, and was stable. The pyridinol averaged .44, .79, and 1.75 ppm but continued to decline and during the last week of feeding averaged only 32% of that in silage the 18th wk. Residue intakes amounted to .009, .022, and .054 mg chlorpyrifos-methyl and .012, .020, and .051 mg of pyridinol/kg body weight and failed to affect silage intake, milk production, blood cholinesterase activity, or body weight gains. Traces of chlorpyrifos-methyl (.003 ppm or less) were only in milk from cows on the 2.24 kg treatment. Milk from all cows fed treated silage contained traces of the pyridinol (.011 ppm or less). No trace of the *O*-analog of chlorpyrifos-methyl was in any sample, and all milk, urine, and feces were free of residues within 1 wk after the cows were withdrawn from treated silage.

76-0469. Frederick, L. L. (Sch. Natur. Resour., Univ. Michigan, Ann Arbor, MI 48104). **Comparative uptake of a polychlorinated biphenyl and dieldrin by the white sucker (*Catostomus commersoni*).** *J. Fish. Res. Board Can.* 32(10): 1705-1709; 1975. (7 references)

White suckers (*Catostomus commersoni*) accumulated the PCB Aroclor 1232 and dieldrin from water at approximately the same rate. However, they accumulated higher PCB levels than dieldrin levels when exposed to equivalent concentrations of these substances. The uptake pattern of Aroclor 1232 components on a whole fish basis and in gill and intestinal tissue was similar to Aroclor 1232 components to which the fish were exposed. The presence of additional components having short chromatographic retention times was observed in liver, brain, and kidney tissues in fish exposed only to Aroclor 1232. (Author abstract by permission)

76-0470. Darrow, D. C.; Harding, G. C. H. (Marine Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada). **Accumulation and apparent absence of DDT metabolism by marine copepods, *Calanus* spp., in culture.** *J. Fish. Res. Board Can.* 32(10): 1845-1849; 1975. (17 references)

^{14}C-*p,p'*-DDT was taken up from sea water by nonfeeding marine copepods held at 6°C for 8 wk. *Calanus* spp. reached an equilibrium DDT level of 50-100 ppm (dry weight) after 3-4 wk exposure in an initial water concentration of ≈450 pptr. No metabolites of *p,p'*-DDT could be detected during this period. (Author abstract by permission)

76-0471. Hunn, J. B.; Allen, J. L. (Fish Contr. Lab., U.S. Dep. Inter. Fish Wildl. Serv., La Crosse, WI 54601). **Renal excretion in coho salmon (*Oncorhynchus kisutch*) after acute exposure to 3-trifluoromethyl-4-nitrophenol.** *J. Fish. Res. Board Can.* 32(10): 1873-1876; 1975. (18 references)

Coho salmon (*Oncorhynchus kisutch*) exposed to an acute, sublethal concentration of 3-trifluoromethyl-4-nitrophenol (TFM) exhibited an increased output of urine when compared with controls, but the urinary excretion of Na, K, Ca, Mg, and Cl was not affected. About 35 times more conjugated TFM than free TFM was excreted during the 24 hr study period. (Author abstract by permission)

76-0472. McLeese, D. W. (Dep. Environ., Fish. Mar. Serv., Biol. Stn., St. Andrews, NB EOG 2X0, Canada). **Chemosensory response of American lobsters (*Homarus americanus*) in the presence of copper and phosphamidon.** *J. Fish. Res. Board Can.* 32(11): 2055-2060; 1975. (24 references)

In test runways the chemosensory response of American lobsters (*Homarus americanus*) to herring muscle extract, applied for about 3 min, is reduced by the simultaneous presentation of copper at concentrations estimated to be 4—80 times the lethal threshold. The reduction results from avoidance of copper. Simultaneous presentation of the extract and of phosphamidon at concentrations about 2.5-100 times the lethal threshold has no effect. Exposure up to 48 hr to copper at concentrations of 0.7-1.8 times the lethal threshold causes a gradual decline in chemosensory response of lobsters, followed by gradual recovery in clean water. Exposure up to 48 hr to phosphamidon at concentrations of 0.7-1.8 times the lethal threshold has no effect on the response. (Author abstract by permission)

76-0473. Schneider, P. W., Jr.; Weber, L. J. (Dep. Fish. Wildl., Oregon State Univ., Corvallis, OR 97331). **Neuromuscular function and acetylcholinesterase in the pectoral abductor muscle of largemouth bass (*Micropterus salmoides*) as evidenced by the effects of diisopropylfluorophosphate.** *J. Fish. Res. Board Can.* 32(11): 2153-2161; 1975. (26 references)

The significance of acetylcholinesterase (AChE) to neuromuscular transmission in the pectoral fin abductor muscle of largemouth bass (*Micropterus salmoides*) was evaluated by establishing in vivo, first, the occurrence of enzyme inhibition by diisopropylfluorophosphate (DFP) and, second, the correlation between muscular response to indirect stimulation and enzyme inhibition. Dose response curves for inhibition of AChE by DFP indicated that DFP had access to and did inhibit AChE. Modification of the muscular response was observed and severity appeared to be positively correlated to AChE inhibition. The modification, however, was not typical of cholinergic systems in that the ability to produce and maintain a tetanus was never abolished even with inhibition in excess of 99% of control levels. It was concluded that AChE is not as important for neuromuscular transmission in largemouth bass as has been established for other vertebrates, and that

the acute toxic effects of DFP to largemouth bass are not mediated by a collapse of neuroskeletal muscle function. (Author abstract by permission)

76-0474. Argyle, R. L.; Williams, G. C.; Daniel, C. B. (U.S. Fish Wildl. Serv., Great Lakes Fish. Lab., Ann Arbor, MI 48107). **Dieldrin in the diet of channel catfish (*Ictalurus punctatus*): uptake and effect on growth.** *J. Fish. Res. Board Can.* 32(11): 2197-2204; 1975. (9 references)

Fingerling channel catfish (*Ictalurus punctatus*) given diets containing 0, 0.4, 0.8, or 4.0 μg dieldrin/g of food gained about 17% less weight than the control fish in 210 days and about 35% less weight during the last 126 days of the 210-day period. No growth differences were attributable to the ingestion of 0.4 or 0.8 μg dieldrin/g of feed. Mortality during the experiment was random and not appreciable. Dieldrin accumulations were characterized by an immediate rapid rise of residue levels in the tissues, followed by a period during which concentrations were relatively stable. Residues in tissues decreased rapidly after dieldrin was withdrawn from the diet. Dieldrin half-life was 9.6 days (mean for the three groups). Theoretical residue concentrations calculated from the growth, feeding, and half-life data were similar to the empirical concentrations, although the theoretical values were consistently the higher. The recoverable concentration accounted for 25.7% (mean of the three treatments) of the theoretical concentration. (Author abstract by permission)

76-0475. Nagasaki, H.; Tomii, S.; Mega, T.; Hirao, K.; Shinohara, Y.; Ito, N. (Dep. Hyg., Nara Med. Univ., Nara, Japan). [**Chronic toxicity of dioctyl phthalate (DOP) in male rats and mice.**] *Nara Igaku Zasshi (J. Nara Med. Assoc.)* 25(6): 649-654; 1974. (19 references) (Japanese)

Male Wistar rats and dd strain mice were used to evaluate the chronic toxicity of orally administered dioctyl phthalate given over a period of 48 weeks. All mice and almost half the rats treated at a dose of 1,000 ppm developed interstitial nephritis. Even at a dose level of 500 ppm this disorder was evident to some extent. A slight increase in GTP-ase activity and a slight decrease in blood sugar levels were found in both species. However, changes in the mice were unremarkable.

76-0476. Nagasaki, H.; Tomii, S.; Mega, T.; Sugihara, S.; Miyata, Y.; Ito, N. (Dep. Hyg., Nara Med. Univ., Nara, Japan). [**Analysis of various factors on liver carcinogenesis in mice induced by benzene hexachloride (BHC) and technical polychlorinated biphenyls (PCBs).**] *Nara Igaku Zasshi (J. Nara Med. Assoc.)* 25(6): 635-648; 1974. (35 references) (Japanese)

The effect of sex was studied on the production of liver tumors in mice treated with BHC and technical PCBs. Male and female mice fed a basal diet containing 500 and 250 ppm of α-BHC for 24 weeks demonstrated neoplastic changes in the liver. The incidence of these changes was higher in male than in female mice. In the livers of male and female mice fed a basal diet containing 500 ppm PCBs (Kanechlor 500) for 32 weeks, similar changes were noted. Neoplastic areas induced by PCBs in the livers of the male mice were typical nodular hyperplasias and well differentiated hepatocellular carcinomas. However, in the livers of female mice, only typical nodular hyperplasias were present. In groups of animals fed diet containing a lower concentration of PCBs, amyloid degeneration of the liver was noted. The effects of PCBs on neoplastic changes induced by α-BHC in the liver were studied. Among groups fed α-BHC alone, only the group given 250 ppm developed nodular hyperplasias and hepatocellular carcinomas. However, after the addition of PCBs to the α-BHC dose, those given 100 or 50 ppm of α-BHC developed nodular hyperplasias and hepatocellular carcinomas. From the results of this study it is concluded that PCBs promote the development of tumors induced by α-BHC.

76-0477. Gamble, W. (Dep. Biochem. Biophys., Oregon State Univ., Corvallis, OR 97331). **Mechanism of action of hypolipidemic and herbicidal aryloxy acids.** *J. Theor. Biol.* 54(2): 181-190; 1975. (38 references)

A mechanism of action for hypolipidemic and herbicidal aryloxy acids is presented based on the known properties of these compounds in biological systems. It is proposed that the aryloxy acids selectively interfere with the utilization of ATP by certain enzymes and/or systems. Marked responses are thus elicited; the nature of these depends on the vector sum of the effects on the individual reactions and the corresponding alterations in the metabolic sequences of which the inhibited or stimulated enzymes are constituents. The response of the organism to aryloxy acids appears to be a result of the inhibition of ATP utilization by certain enzymes of systems which thereby alter the amount of ATP available to react with other enzymes or systems. This change in the amount of ATP available would account for both the observed inhibition and stimulation of a given enzyme, and also stimulation of growth and respiration and mitochondrial enlargement. Mitochondrial enlargement may result from increased RNA polymerase activity and protein synthesis. Failure of aryloxy acids to accumulate in the organism and reversal of metabolic effects on removal of the acids are compatible with this hypothesis. It is concluded that the ATP levels and redox state are important for maintaining homeostasis in a given system. Therefore, it is possible that substances interfering directly or indirectly with intrinsic regulatory control of processes by ATP may cause "metabolic trauma." A model composed of 4 enzymes, acetyl CoA carboxylase, citrate cleavage enzyme, phosphorylase, and CoA-sn-glycerol phosphate acyltransferase, is described to test the proposed mechanism.

76-0478. Preache, M. M.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI). **Effects**

of food deprivation, phenobarbital, and SKF-525A on teratogenicity induced by 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) and on disposition of (^{14}C)dinoseb in mice. *J. Toxicol. Environ. Health* 1(1): 107-118; 1975. (13 references)

Dinoseb was given to Swiss-Webster mice (0-18.8 mg/kg/day, i.p.) on days 10, 11, and/or 12 of gestation. Treatment with dinoseb was preceded by starvation for periods of 24 or 48 hr, or by pretreatment with phenobarbital or 2-dimethylaminoethyl-2,2-diphenylvalerate hydrochloride (SKF-525A). SKF-525A potentiated and phenobarbital inhibited resorption and reductions in fetal body weight induced by dinoseb. External, soft tissue, and skeletal anomalies induced by dinosob were magnified by 24 hr food deprivation and SKF-525A pretreatment. However, food deprivation for 48 hr had no effect. Phenobarbital generally protected against teratogenicity. Food deprivation for 24 hr slowed and phenobarbital hastened the disappearance of dinoseb from plasma. Food deprivation for 48 hr and SKF-525A pretreatment did not affect disappearance of dinoseb from plasma. However, they did, respectively increase and decrease the rate of disappearance from the liver. The results of this study led to the suggestion that the alterations in dinoseb-induced embryotoxicity and teratogenicity by the pretreatment could have been related to an alteration in the rate of disappearance of dinoseb from the mother.

76-0479. Van Velzen, A.; Kreitzer, J. F. (Patuxent Wildl. Res. Cent., Laurel, MD 20811). **The toxicity of *p,p'*-DDT to the clapper rail.** *J. Wild. Manage.* 9(2): 305-309; 1975. (10 references)

The LC50 (concentration of toxicant in the diet expected to kill half of the test birds in 5 days) for *p,p'*-DDT in clapper rails (*Rallus longirostris*) was found to be 1,612 ppm for males and 1,896 ppm for females. Amounts of DDT + DDD in the brains of birds that died were significantly greater ($P \times 0.01$) than those in the brains of survivors. Thirty ppm DDT + DDD approximated the lower limit of these compounds in the brains of rails diagnostic of death from DDT poisoning. Residues in livers and carcasses are reported. Considering the relatively high resistance of the clapper rail to DDT poisoning, we concluded that exposure to this pesticide in marshes is not likely to be a significant factor in mortality of adult rails. Effects other than direct mortality were not evaluated in this study. (Author abstract by permission)

76-0480. Schitoskey, F., Jr. (U.S. Fish Wildl. Serv., Denver, CO 80225). **Primary and secondary hazards of three rodenticides to kit fox.** *J. Wildl. Manage.* 39(2): 416-418; 1975. (14 references)

Acute oral LD50s to the kit fox (*Vuppes macrotis*) were determined to be 0.22 mg/kg for compound 1080 (sodium monofluoroacetate), 0.75 mg/kg for strychnine alkaloid, and 93 mg/kg for zinc phosphide. One fox each died within hours when fed a kangaroo rat (*Dipodomys* sp.) killed by 0.74 mg of 1080 or 12.8 mg of strychnine, amounts one rat might consume in field baiting programs. However, foxes survived repeated feedings of kangaroo rats each killed by 480 mg of zinc phosphide, equivalent to 3 times the LD50 for a fox and some 29 times the amount one rat might consume in bait. (Author abstract by permission)

76-0481. Nakamura, H.; Sekiguchi, Y.; Kobayashi, N. (Agric. Chem. Inspect. St., Min. Agric. Forestry, Kodaira, Tokyo, Japan). [**Recently registered new agricultural chemicals.**] *Kongetsu No Noyaku (Agric. Chem. Mon.)* 19(12): 84-91; 1975. (Japanese)

Colofonate insecticide, amitraz acaricide, bentazon herbicide, and orthobencarb herbicide were recently introduced. The respective active ingredients are *S*-(5-chloro-2, 4-thiazolyl) methyl dimethyl phosphorothiolothionate; 3-methyl-1,5-bis (2,4-xyleyl)-1,3,5-triazapenta -1,4-diene; 3-isopropyl-2,1,3- benzothiadiazinone- (4)-2,2-dioxide; and *S*-(2-chlorobenzyl) *N,N*-diethylthiocarbamate. Their acute p.o. toxicities (LD50) are respectively 1180, 1460, 1320, and 1000 mg/kg in male mouse; 760 and 450 mg/kg male rat. The fish toxicities (TLm 48 hr) to young carp are respectively 8-12, 1.17, greater than 100, and 3.4 ppm.

76-0482. Van Dyke, R. A.; Gandolfi, A. J. (Dep. Anesthesiol., Mayo Clinic Fdn., Rochester, MN 55901). **Characteristics of a microsomal dechlorination system.** *Mol. Pharmacol.* 11(6): 809-817; 1975. (38 references)

Microsomes were solubilized and the components of the mixed-function oxidase system were isolated. With a reconstituted system containing partially purified cytochrome P-450, NADPH-cytochrome c reductase, NADPH, and phospholipid, dechlorination of 1,1,2-trichloroethane was observed. Addition of cytochrome b_5 system by itself would not dechlorinate. The activity of the complete system was not altered by the presence of the cyanide-sensitive factor. Whole microsomes also were studied and the kinetics of the dechlorination reaction was determined. The *K*m was 3.32 n*M*; *V*max was 1.09 nmol of substrate dechlorinated per minute per milligram of protein. The addition of NADPH to the NADPH system significantly increased both *K*m and *V*max. The microsomal enzyme system required molecular oxygen; the presence of the cell supernatant fraction produced an increase in the *V*max of dechlorination. (Author abstract by permission of Academic Press)

76-0483. Robinson, J. R.; Felton, J. S.; Levitt, R. C.; Thorgeirsson, S. S.; Nebert, D. W. (Dec. Develop. Pharmacol., Nat. Inst. Child Health Hum. Develop., Bethesda, MD 20014). **Relationship between "aromatic hydrocarbon responsiveness" and the survival times in mice treated with various drugs and environmental compounds.** *Mol. Pharmacol.* 11(6): 850-865; 1975. (58 references)

Differences in toxicity caused by various environmental pollutants or drugs were studied in several inbred

strains of mice and in siblings of the (C57BL/6N) (DBA/2N)F_1 × DBA/2N backcross, in which the phenotypes aromatic hydrocarbon "responsiveness" or "nonresponsiveness" had been determined. This trait of "responsiveness"—which refers to the capacity for induction of cytochrome P_1450 and numerous monooxygenase activities by certain aromatic hydrocarbons—has been previously shown to segregate almost exclusively as a single gene among offspring of the (C57BL/6N) (DBA/2N)F_1 × DBA/2N backcross. "Responsiveness" is associated with shortened survival times following large (500 mg kg^{-1} day^{-1}) doses of intraperitoneal benzo[a]pyrene, 7.12-dimethylbenz[a]anthracene, 3-methylcholanthrene, β-naphthoflavone, or polychlorinated biphenyls; the cause of death in these experiments is not yet certain. "Nonresponsiveness" is associated with shortened survival times following smaller (120 mg kg^{-1} day^{-1}) oral doses of benzo[a]pyrene, 7,12-dimethylbenz[a]anthracene, 3-methylcholanthrene, or lindane, yet is associated with a longer survival time following small daily doses of oral polychlorinated biphenyls. All nonresponsive mice ingesting benzo[a]pyrene daily is not significantly different from that of control mice; the apparent cause of early death in these experiments is toxic depression of the bone marrow, the pancytopenia leading to death due to hemorrhage or overwhelming infection. When given an intraperitoneal dose of lindane that is lethal to normal mice within 12 hr, 3-methylcholanthrene-treated responsive mice are protected and therefore do not die during this time period. A dose of bromobenzene sufficient to cause considerable necrosis in the liver of a pregnant mouse does not transplacentally cause any detectable necrosis in fetal liver. Genetic differences in aromatic hydrocarbon responsiveness between C57BL/6N and DBA/2N mice are not associated with toxicity caused by large intraperitoneal daily doses of bromobenzene, zoxazolamine, diphenylhydantoin, dichlorodiphenyltrichloroethane (*p,p'*-DDT), hexachlorobenzene, butylated hydroxytoluene, chlorpromazine, tetracycline hydrochloride, carbamazepine, or diphenylbarbituric acid, and are not associated with differences in survival time following bromobenzene or *p,p'*-DDT in the diet. This data suggests that the life span of animals exposed to certain environmental compounds can be markedly influenced by a single gene or a very small number of genes, and that the same genetic trait can be either beneficial or detrimental to the animal, depending on whether detoxification or metabolic potentiation occurs. (Author abstract by permission of Academic Press).

76-0484. De Serres, F. J. (Environ. Mutagenesis Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **The utility of short-term tests for mutagenicity in the toxicological evaluation of environmental agents.** *Mutat. Res.* 33(1): 11-15; 1975.

Studies are being conducted to compare the mutagenic activity of known chemical carcinogens and non-carcinogenic structural analogs. A total of 60 compounds is under study in Japan and 105 in the United States, for a total of 152 different compounds. In this work the capability has been developed to screen environmental chemicals for two important toxicological properties: mutagenic activity and carcinogenic activity. These tests are still not definitive, but offer presumptive conclusions about the mutagenic and carcinogenic activities of given compounds in man. Due to the complexity of this task, computer storage and retrieval of information is being used to provide immediate access to such data for all interested parties. Short term tests are available which are simple enough to be used not only on pure compounds, but also for testing commercial grade chemicals as well as formulated products. This is an important concept in the current revision of the pesticide regulations. These same tests can be used to maintain quality control.

76-0485. Balasubramanian, A.; Siddaramappa, R. (Microbiol. Div., Univ. Agric. Sci., Bangalore, India). **Effect of simazine application on certain microbiological and chemical properties of a red sandy loam soil.** *Mysore J. Agric. Sci.* 8(2): 214-218; 1974. (8 references)

Simazine was applied at the recommended field application rate (1 kg/acre) and at 10 times this rate to Hebbal red sandy loam soil in screw-cap glass bottles. Ammonium sulfate was applied at the rate of 40 kg N/acre and the soil moisture was maintained at 60% of the maximum water holding capacity. The samples were incubated at 20-25°C and were sampled at 10-day intervals. Simazine treatment suppressed the bacterial population of the soil and enhanced the actinomycete population with no marked effect on the fungal population. Although the activities of the enzymes invertase and amylase varied as a result of pesticide treatment, the observed changes showed no definite relationship to the changes in microbial populations. The evolution of CO_2 was reduced in the simazine-treated soil as compared with untreated control soil, and simazine produced an increase in the rate of nitrification in the soil. The soil pH did not increase beyond 5.2 during the study. Most of the effects of simazine were increased when the pesticide was applied at 10 times the recommended rate.

76-0486. Thontadarya, T. S.; Gowda, H.; Prabhuswamy, H. P.; Shetty, S. V. R. (Univ. Agric. Sci., Hebbal, Bangalore, India). **Effect of phorate (Thimet) residue in the treated rice plant and water on buffalo calves.** *Mysore J. Agric. Sci.* 8(2): 228-234; 1974. (2 references)

Twenty-five-day-old paddy seedlings (Taichung 65) were transplanted and treated with phorate granules at a rate of 1.8 kg active ingredient per acre. The pesticide was applied in two equal doses at intervals of 15 and 45 days after transplantation. Five male buffalo calves were released into the treated paddy fields 24 hr after the second application of phorate, where they were allowed to graze between 8 am and 4 pm each day for 26 days. Analysis of the calves' blood revealed no significant effect of phorate

on the serum cholinesterase activity. Similarly, the pesticide had no apparent dermal effect on the animals, nor were any significant changes noted in pulse rate, respiration rate, body temperature, body weight, appetite, or weight gain. A quantity of 7.25 ppm of phorate residue equivalent was present in the treated plots 10 days after the second pesticide application.

76-0487. Seidler, H.; Macholz, R. M.; Haertig, M.; Kujawa, M.; Engst, R. (Zentralinst. Ernaehrung, Bereich Framdst. Nahrung Ernaehrung, GDR-1505 Bergholz-Rehbruecke, DDR). **Untersuchungen ueber den Metabolismus einiger Insektizide und Fungizide in der Ratte. 4. Mitt. Verteilung, Abbau und Ausscheidung von 14-C markiertem Lindan. [Studies on the metabolism of certain insecticides and fungicides in the rat. Part IV. Distribution, degradation, and excretion of carbon-14-labeled lindane.]** *Nahrung* 19(5/6): 473-482; 1975. (11 references) (German)

The distribution, excretion, and partial metabolism of ^{14}C-lindane were determined in 14 organs, feces, and urine after adaptation of the rats to orally administered lindane. The principal deposition sites are fat, kidneys, and musculature. The pituitary and thyroid glands were characterized by high specific activity. In the brain, marked differences in labeling were observed between cortex, brain stem, and cerebellum. The metabolite δ-2,3,4,5,6-pentachlorocyclohexane (γ-PCCH) and the sum of the metabolites pentachlorobenzene (PC1B) and hexachlorobenzene amounted to 1-3% of the hexane extract after 24 hr and 5-8% after 72 hr in certain organs. Feces, urine, and organs contained large amounts of conjugates and highly polar, hexane-soluble metabolites. The level of extractable (i.e., non-bound) ^{14}C-activity in the urine was 8% and in the feces, 43%. The level of extractable activity was 35% in both urine and feces after 72 hr. An additional 3 and 8% after 24 hr and 18 and 14% respectively after 72 hr were present as glucuronides, and the remainder as unidentified water-soluble conjugates. In the urine, 1-3% of lindane was present in free form; 3-6% of the total lindane was extracted unmetabolized. The γ-PCCH and PC1B + HCB accounted 0-2.5% of the total excreted lindane. Half of the lindane administered was excreted within 3-4 days.

76-0488. Seidler, H.; Haertig, M.; Lewerenz, H. J. (Zentralinst. Lernaehr., Bergholz-Rehbruecke, DDR). **Die Kontrolle der Schilddruesenfunktion mit Radiojod fuer die toxikologische Untersuchung von Fremdstoffen. [Thyroid function monitoring radioactive iodine in the toxicological investigation of foreign substances.]** *Nahrung* 19(8): 715-726; 1975. (21 references) (German)

A test system is reviewed for testing the function of the thyroid gland by means of radioactive iodine under the influence of foreign substances, and studies are discussed on functional changes provoked in the thyroid gland by maneb and ethylene thiourea. After 45 hours of observation, the thyroid gland is analyzed for ^{131}I, ^{131}I-triiodothyronine, and ^{131}I-thyroxine; the serum is analyzed for ^{131}I, ^{131}I-triiodothyronine, ^{131}I-thyroxine, and protein-bound ^{131}I; and the liver is analyzed for ^{131}I and protein-bound ^{131}I. The urine is also analyzed for ^{131}I. Maneb and especially ethylene thiourea, fed to rats at a rate of 150 ppm in the diet for 90 days, caused marked hypofunction of the thyroid gland. The thyroxine levels were affected more strongly than the triiodothyronine levels, which suggests interference with thyroxine storage or metabolism and interference with the oxidation of iodide and with hormone synthesis. The high thyroid quotient is indicative of stimulation of the thyroid gland, most probably by thyrotropin. Part of the maneb was excreted unchanged in the feces before it could be metabolized to ethylene thiourea. Any direct reaction of maneb, ethylene thiourea, ethylene monosulfide, or thiourea with iodide can be ruled out under physiological conditions.

76-0489. Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14850). **Microbial degradation of DDT.** *Natl. Tech. Inform. Serv.*, AD-762 469, 1973, 26 p.

Over 110 marine bacteria were isolated and tested for their ability to convert DDT to water-soluble products. Forty-seven were found to convert 5% to 10% of the ^{14}C-DDT to water-soluble products, 38 solubilized less than 5% of the insecticide, and 29 were apparently inactive by the test methods employed. *Mucor alternans*, a fungus exceptionally active in producing water-soluble metabolites from DDT, was used as a model for determining the identities of the water-soluble metabolites. Although these compounds have not yet been identified, they are not DDT, DDA, DBH, DBP, PCPA, or 2-chlorosuccinic acid. Therefore, previously uncharacterized products are probably formed by *M. alternans*. The hypothesis that nutrient availability is limiting DDT degradation is now being tested. For this purpose natural microbial communities of sea water containing bottom sediments are being subjected to a large number of different treatments in an attempt either to enrich for DDT-degrading organisms or to provide the conditions necessary for rapid DDT decomposition. (Author abstract by permission)

76-0490. Sikka, H. C.; Miyazaki, S.; Rice, C. P. (Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Metabolism of selected pesticides by marine microorganisms.** *Natl. Tech. Inform. Serv.*, AD-763 410, 1973, 16 p.

A number of marine microorganisms including algae, bacteria, fungi, and yeasts were tested for their ability to metabolize carbaryl (1-naphthyl-*N*-methyl-carbamate) and 1-naphthol. None of the species included in the study were able to degrade carbaryl to a significant extent. Conversion of 1-naphthol to ether-soluble and water-soluble metabolites was observed in cultures of *Culcitalna achraspora, Halosphaeria mediosetigera, Humicola alopallonella, Aspergillus fumigatus, Serratia marina, Spirrillum* sp., and *Flavobacterium* sp. The first three organisms were more effective in degrading 1-naphthol to water-

soluble metabolites than the remaining species. A very small amount of carbaryl was metabolized to water-soluble metabolites by the algae *Cyclotella nana* and *Dunaliella tertiolecta*. 1-Naphthol was more toxic to the algae *Cyclotella* and *Dunaliella* than the parent compound, carbaryl. *Cyclotella* was more sensitive to both carbaryl and 1-naphthol than *Dunaliella*. Treatment with 0.2*M* carbaryl or 1-naphthol reduced photosynthetic CO_2 fixation in *Cyclotella*. (Author abstract by permission)

76-0491. Revzin, A. M. (FAA Civil Aeromedical Institute, Oklahoma City, OK 73125). **Subtle changes in brain functions produced by single doses of mevinphos (phosdrin).** *Natl. Tech. Inform. Serv.*, AD-763 509, 1973, 9 p.

Mevinphos (phosdrin) was found to inhibit the amplitude of hippocampal evoked potentials in unanesthetized squirrel monkeys with chronically indwelling electrodes. The threshold dose was 0.050 mg/kg and the maximal dose studied was 0.200 mg/kg. Doses above 0.200 mg/kg induced hippocampal seizures. Within the dose range of 0.050 mg/kg to 0.200 mg/kg the amplitude and duration of the inhibition were directly proportional to dose. No peripheral signs of poisoning, such as tremor or enlivation, were seen at doses of 0.200 mg/kg or under. The discussion emphasizes that mevinphos produces changes in brain function in the absence of the peripheral symptomatology usually taken as indicators of poisoning by aerial applicator personnel. Therefore, it is concluded that exposure to mevinphos may be unexpectedly hazardous since the aerial applicators may be unaware that they have been poisoned. (Author abstract by permission)

76-0492. Sguros, P. L. (Dep. Biol. Sci., Florida Atlantic Univ., Boca Raton, FL). **Microbial degradation of cyclodiene pesticides.** *Natl. Tech. Inform. Serv.*, AD-778 763, 1974, 105 p.

Decomposition of the pesticides aldrin and dieldrin by aquatic microorganisms may result in more harmful products affecting the ecosystem. Isolates from fresh, brackish, and littoral water were cultured using, variously, selective media, enriched laboratory ecosystems, and impregnated wood strips and assessed qualitatively and quantitatively for action on pesticides by thin-layer chromatography, gas-liquid chroatography, and ^{14}C-labeled pesticide autoradiography. Growth was measured in terms of dry wt and cell nitrogen. Small amounts of possible metabolites were indicated in most isolate preparations. Cellulolytic *X. xylestrix* grew well in media containing 10-500 μg/ml pesticide. Growth was stimulated by small quantities of the chemical and the fungus accumulated pesticides to levels 2000 times higher than the original medium concentration. Uptake increased linearly with increasing pesticide concentration. A significant portion of the pesticides appeared to be chemically altered, but the products were not specifically identified. (Author abstract by permission)

76-0493. Canty, A. J.; Kishimoto, R. (Chem. Dep., Univ. Tasmania, Hobart, Tasmania). **British anti-Lewisite and organomercury poisoning.** *Nature (London)* 253(5487): 123-125; 1975. (22 references)

To provide an understanding of the chemistry involved in the interaction of 2,3-dimercaptopropanol ($BALH_3$) with mercury compounds in the body, physical and spectroscopic properties were studied on complexes formed by the reaction of mercuric salts and phenylmercuric acetate with $BALH_3$ in water. These reactions led to the precipitation of HbBALH and $(C_6H_5Hg)_2BALH$, respectively; these complexes were compared with the analogous 1,3-dimercaptopropanol (DMPHs) complexes. All of the complexes were insoluble in water and common organic solvents, whereas all but HgBALH dissolved in pyridine and dimethylsulfoxide. HgDMPH and HgBALH probably assume a polymeric or oligomeric structure in the solid state, and molecular weight data indicates monomeric structures for the phenylmercury derivatives. In aqueous suspension, $(C_6H_5Hg)_2BALH$ is stable with an excess of $BALH_3$. The complex is also stable in pyridine and dimethylsulfoxide, but the addition of acetone to this solution results in the precipitation of HgBALH and the formation of diphenylmercury. In some solvent, $(C_6H_5Hg)_2BALH$ decomposes according to: $(C_6H_5Hg)_2BALH$ HgBALH + $(C_6H_5)_2Hg$. The formation of diphenylmercury may be an important factor in the distribution of mercury when $BALH_3$ is administered with phenylmercuric acetate. This data indicates the need for caution in the use of BALH as an antidote for chronic phenylmercury poisoning.

76-0494. Kraus, P. (Inst. Toxikol. Pharmakol., Philipp's-Univ., Marburg/Lahn, Germany). **Biodegradation of alpha-hexachlorocyclohexane. VI. The dechlorination of** α-hexachlorocyclohexane by microsomes and cytosol of rat liver. *Naunyn-Schmiedeberg's Arch. Pharmacol.* 291(1): 79-87; 1975. (12 references)

Alpha-hexachlorocyclohexane (α-HCH, α-BHC) is dechlorinated by enzymes contained in rat liver cytosol and microsomes. Evidence was obtained that in the cytosol there are two α-HCH dechlorinating enzymes at least: one operates only in the presence of reduced glutathione (GSH) and catalyzes dechlorinations associated with the formation of another hydrophilic product. This product is probably a conjugate of the α-HCH-residue with GSH. The other cytoplasmic α-HCH-dechlorinase requires no additions. The microsomes, too, contain two α-HCH dechlorinases at least: one is stimulated by GSH, the other by NADPH. (Author abstract by permission)

76-0495. Hananouchi, M.; Sugihara, S.; Ogiso, T.; Aoe, H.; Hirose, M.; Nakamura, Y.; Ito, N. (Nagoya Municipal Univ. Hosp. Nagoya, Aichi, Japan). [**Experimental studies on the growth and development of liver tumors in mice given BHC.**] *Nippon Gangakkai Kiji (Proc. Jpn. Cancer Assoc. Annu. Meet.)* 34: 16; 1975. (Japanese)

Groups of male dd-mice were given daily diets containing 500 ppm of α-BHC for 16, 24, and 32 weeks and sacrificed at 4-week intervals, and the development of liver tumors was studied pathohistologically and electromicroscopically. The tumor incidence was 24, 70, and 100%, respectively, in case of administration for 16, 24, and 32 weeks; the tumors were predominantly nodular hypertrophies with large ovoid nuclei and enlarged nucleoli. However, when the administration of α-BHC was stopped for 4 weeks at the 20th week, the incidence was 40 and 94.7% respectively for the 20 week and 24 week groups. When administration was stopped for 8 weeks the incidence was 25 and 47% with rapidly reducing liver weight. After stopping the BHC administration for 36 weeks, the incidence was recognized as 100% hepatocellular hepatoma. After the carcinostatic period, infiltration of interlobar cells between proliferated liver cells was seen. The findings suggest a major role for the interlobar cells in the transition from precancerous changes to hepatocarcinogenesis.

76-0496. Hanada, M.; Kakudo, K. Miyachi, T. (School of Pathology, Faculty of Med., Osaka Univ., Osaka, Japan). [**The development and involution of liver tumor due to benzene hexachloride.**] *Nippon Gangakkai Kiji (Proc. Jpn. Cancer Assoc. Annu. Meet.)* 34: 33; 1975. (Japanese)

Groups of 7-week-old male dd mice were fed daily diet containing 600 ppm α-BHC for one, three, five, and seven months respectively, and were then sacrificed. Other groups were fed as above, then given basic diet for 2-5 months and sacrificed. In the first groups, swelling, degeneration and necrosis were found after one month of administration and nodular proliferation of enlarged liver cells was seen after 3 months of administration, without visible nodules. Liver nodules were found after 5 months of administration. The nodes further enlarged after two more months of administration. Histologically, the arrangement of cells in larger nodes became irregular with many nuclear divisions, suggesting malignancy. In the group in which administration was stopped after node development, involution was recognized, with characteristic sedimentation of lipofuscin.

76-0497. Konishi, Y.; Makiura, S.; Miyata, S.; Denda, A.; Sugihara, R.; Ito, N. (Dep. Tumor Pathology, Cancer Center, Nara Med. Coll., Nara, Japan). [**Biochemical and electron microscopic studies on the effects of α-BHC in mouse liver cells.**] *Nippon Gangakkai Kiji (Proc. Jpn. Cancer Assoc. Annu. Meet.)* 34: 34; 1975. (Japanese)

A dimethylsulfoxide solution containing 1.5 μCi of radiocarbon-labeled α-BHC was injected intraperitoneally into dd mice. The intrahepatic distribution was examined after 4 hr and the organ distribution after 24 hr and more. In another experiment, unlabeled α-BHC was given intraperitoneally to dd mice at 25, 50, 75, and 100 mg/kg, respectively; early changes in liver parenchymal cells were examined, as well as the effects on the nuclear RNA synthesis using tritium-labeled crotic acid. The concentration of α-BHC was highest in adipose tissue, followed by brain, kidney, liver, and lung in descending order; levels were highest 4 hr after administration. Fifty percent of the α-BHC administered remained in the liver even after 24 hr. RNA synthesis was not inhibited. Multiple nucleoli were seen in the enlarged nuclei of liver parenchymatous cells with microspherules. In the cytoplasm many aggregated smooth-surfaced vacuoles and increased microbodies were seen.

76-0498. Tsunenari, S.; Muto, H.; Inoue, S.; Sasaki, S.; Sugita, H.; Kanda, M. (Sch. Leg. Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Forensic toxicological studies of a herbicide, gramoxone.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 29(2): 88-102, 1975. (21 references) (Japanese)

In view of the frequent deaths due to accidental and suicidal ingestion of gramoxone, a herbicide containing 24% paraquat dichloride as the active ingredient, the toxic manifestations and analytical properties of this herbicide were examined. The LD50 was found to be 0.39-0.43 mg/kg (formulation) and 93.6-103.2 mg/kg (calcd. for a.i.), p.o. in the mouse. The findings on autopsy of the mice included nonspecific congestion in the organs and subserosal hemorrhages in the lungs, irreversible histological collapse of alveoli accompanied by congestion. However the specific cell proliferation in the bronchioles and alveolar wall which had been said to be specific for gramoxone was not found. The practically applicable methods for qualitative and quantitative analysis were TLC followed by color reaction with dithionite TLC-colorimetry, column chromatography-colorimetry, and column chromatography-gas chromatography. A suicide case was described in detail. At 34 hr after death, the concentrations of paraquat dichloride in blood, urine, brain, lungs, liver, and kidney were 2.88, 6.34, 0.51, 0.64, 2.40, and 7.38 mg/100 g.

76-0499. Matsubara, H.; Obara, Y.; Kuba, N. (Dep. Agric. Chem., Fac. Agric., Meijo Univ., Nagoya, Japan). [**Blindness due to *S*-triazine herbicides and closely related compounds in baby chicks. (Studies on the biological activity of heterocyclic compounds. Part 1).**] *Nippon Nogai Kogaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 49(9): 439-443; 1975. (10 references) (Japanese)

Male baby chicks of Warren-Sex-Sal-Link-F strain were fed 19 *s*-triazine herbicides and related compounds. No marked acute oral toxicity was demonstrated by compounds with substituted hydroxyl and thiol groups on the 2-position of the *s*-triazine skeleton with the exception of hydroxypropazine and hydroxytrietazine. Other compounds did show considerable toxicity. When the level of the *s*-triazines in feeds was 3-5%, none of the compounds with the exception of ammeline, caused blindness in baby chicks. Based on the results of this study it was suggested that the metabolism of *s*-triazine herbicides and related

compounds to ammeline did not produce amounts of ammeline sufficient to cause blindness.

76-0500. Fujita, K.; Fujita, H.; Funasaki, Z.; (Saku Gen. Hosp., Nagano, Japan). [**Cytogenetic studies of 2,4,5-T related substances.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 432-433; 1975. (Japanese)

Studies were performed to examine the cytogenetic effects of high purity 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and to determine whether the teratogenicity of crude 2,4,5-trichloroacetic acid was due to 2,4,5-T or to dioxin. The experiments were carried out by culturing peripheral venous blood from healthly adults in the presence of 2,4-D, 2,4,5-T, 2,4,5-trichlorophenoxy propionic acid (2,4,5-TP), or 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (dioxin), and the observing the chromosomes. The content of the 2,4,5-T contained 0.09 dioxin and 2,4,5-TP less than 0.053 ppm. The results of the experiments showed a correlating between the frequency of chromosome breakage and the respective concentrations of 2,4,5-T and 2,4,5-TP, and suggested that if the dioxin content of 2,4,5-TP was several hundred fold less than that of 2,4,5-T, the two relationships would coincide.

76-0501. Sakuma, H.; Tomita, M.; Nishimura, M. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**On the spray-inhalation apparatus and the inhalation toxicity of organophosphorus pesticides to rats.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 446-447; 1975. (Japanese)

Results of experiments on the inhalation toxicity of fenitrothion and pyridafenthion (diethyl 6-oxo-1-phenyl-1H-pyridazin-3-yl phosphorothioate) in rats using a spray-inhalathion apparatus were described. After inhaling a mist of fenitrethion at 3240 and 4890 mg/m^3 for one hr, no rats died. After inhaling pyridafenthion mist at 248, 329, 827, and 1130 mg/m^3 (dissolved in a 10% aqueous solution of diethylene glycol) for 1-6 hr, no deaths of rats were observed. However, specific symptoms were noted, such as lachrymation, salivation, and nasal and ocular hemorrhage. In both cases, cholinesterase activity in plasma and erythrocytes declined; however, gradual recovery was observed relatively soon in plasma, and relatively slowly in erythrocytes.

76-0502. Suzuki, A.; Asanuma, S.; Kurosawa, K.; Shimazaki, K.; Yanagisawa, T.; Abe, E.; Sasaki, K.; Kawahara, K. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Electron microscopic studies on the changes caused in tissues by organophosphorus pesticide. Part 2.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 448-449; 1975. (Japanese)

One-hundred twenty-five male rats were evenly divided into 5 groups, A,B,C,D and E. Groups C, D, and E, respectively, received 30 mg/kg of fenitrothion (dissolved in olive oil), 30 mg/kg of fenitrothion (as emulsifiable concentrate), and 7 mg/kg of fenitrothion plus 2.8 mg/kg of dichlorvos (as a mixed solution in solvent). Group A received 1.3 mg/kg of olive oil and Group B received 1.3 mg/kg of the emulsifier. They were killed after 3 hr and 1, 5, 15, and 30 days to determine residual fenitrothion and ChE, and to examine microscopically and electron microscopically the morphological changes in external ocular muscle, liver, kidney, and bone marrow. Fenitrothion disappeared from organs at 5 days after administration. Pathohistologically an effect of fenitrothion appeared earlist in the kidney. The findings on the external ocular muscle and its nerve end plate were described in detail. In Group E the thickening of the junctional fold of synapses was increased and rupture of the synaptic membrane was observed, suggesting synergism and acceleration of permeation by both pesticides.

76-0503. Asanuma, N.; Suzuki, A.; Kurosawa, K.; Sasaki, K.; Abe, E. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Experimental studies on organophosphorus pesticides residues in living bodies.**] *Nippon Noson Igakkai Zasshi (J. Jpn Assoc. Rural Med.)* 24(3): 450-451; 1975. (3 references) (Japanese)

Fenitrothion was administered to male Wistar rats at 30 mg/kg as a solution in olive oil or as an emulsifiable concentrate. A mixture of fenitrothion, 7 mg/kg, and dichlorvos, 2.8 mg/kg, was also administered to another group of male Wistar rats. They were sacrificed after 3 hr, or 1, 5, 10, 15 or 30 days, and the levels of fenitrothion were determined in their organs. The residual amounts in organs reached a maximum after 3 hr - one day, then gradually declined, and in the kidney remained relatively high even after 5 days. Each group excreted the greater part of fenitrothion and its metabolites after one day, except for the group administered the emulsifiable concentrate. ChE showed a minimal value on the first day, then gradual recovery. However, the group administered the mixture showed recovery of ChE even on the first day. The residue in the brain on the first and fifth days, the time required for excretion, and the reduction of ChE suggested synergism between fenitrothion and the emulsifier and other ingredients in the preparation of the emulsifiable concentrate.

76-0504. Ogura, K.; Tsutsui, J.; Suzuki, H.; Nakanishi, M.; Nakabayashi, H. (Sch. Pathol., Fac. Med., Mie Univ. Tsu, Mie, Japan). [**Studies on the toxicity of paraquat-dichloride.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 458-459; 1975. (Japanese)

In order to elucidate the mechanism of intoxication by paraquat dichloride, male rats of the Wistar strain were forcibly given 24, 12, or 6 mg of paraquat-dichloride per kg p.o. Their body weights were determined daily for 7 days. Hematological and biochemical examinations and determinations of paraquat dichloride were carried out after 2, 24, 72 and 72 and 120 hr. The body weight increase was highest in controls, followed by those given 24 mg/kg, 12 mg/kg, and 6 mg/kg in that order. The mortality was

greatest in those given 24 mg/kg (45.87%), followed by those given 12 mg/kg (25%) and those given 6 mg/kg (16.7%) during 7 days. Of the biochemical parameters, abnormal values were observed for GOT and LDH. Histological impairments were proportional to the dose rate. Lung impairment was most conspicuous and was accompanied by external pericarditis, edema of the myocardium, and hepatocellular necrosis of the central lobe. Although paraquat was almost not detected after 24 hr the tissue impairments were most conspicuous after 24 hr. Lung impairment was seen after 120 hr. These injuries were thought to change into lung fibrosis.

76-0505. Kangas, J.; Makela, J. (Statens Veterinarmedicinska Anstalt, Helsinki, Finland). **Dikumarols abortframkallande effekt hos mink. [Dicoumarol as the cause of abortion in mink.]** *Nord. Veterinaermed.* 26(7-8): 444-447; 1974. (3 references) (Swedish)

The effect was studied of dicoumarol on abortion in mink. Pregnant minks were fed diets containing dicoumarol for 4-21 days. The daily doses were 0.2, 0.6, and 1.2 mg/kg body weight. Minks fed 1.2 mg/kg doses died due to hemorrhages within 4-6 days. Abortions were observed in minks fed 0.2-0.6 mg/kg doses for at least 8-10 days. Non-clotted blood was found on autopsy in minks fed 0.6 and 1.2 mg/kg doses of dicoumarol. The heart, liver, and kidneys were normal.

76-0506. Hashimoto, K. (Biol. Lab. Nippon Noyaku Co., Ltd., Nagano, Osaka, Japan). **[A new systemic antirice blast agent, fujiwan.]** *Shokubutsu Bocki (Plant. Protect.)* 22(4): 3-7; 1975. (Japanese)

The acute toxicity of Fujiwan, diisopropyl- 1,3-dithiolan- 2-ylidene malonate, to mice was represented by LD50 values in mg/kg of 1350 (male) and 1520 (female) p.o., 440 (male) and 600 (female) i.p., greater than 10,250 (male) and greater than 5,000 (female) dermal. Corresponding values in rat are 1,190 (m) and 1,340(f) p.o., 480 (m) and 640 (f) i.p., and in guinea pig (m) 1,020 p.o., rabbit 2,320 p.o., tree frog 750 p.o., and leopard frog 1,000 mg/kg p.o. The maximum nontoxic level for mice was 14.3 mg/kg/day (in a 3 month subacute test). No teratogenic activity was found at 600 mg/kg/day. Radioactivity given as ^{14}C (dithiolan-ring labeled) Fujiwan disappeared very soon (in 3 days) from mice. No accumulation in the body of rats after one year of continuous administration was found. When Fujiwan was applied to soil it was completely decomposed in 10 days to ethanedisulfonic acid and hydroxy ethylsufonic acid. The rec-assay of Fujiwan and its metabolites using B. *subtilis* and the mutagenic assay with *S. typhimurium* were negative, as was the host mediated test with B. *subtilis* at 1,000 mg/kg of Fujiwan. The residue level in brown rice after 64 days was 0.022 ppm. A two-year chronic toxicity test, now ending, indicated no carcinogenicity nor other abnormal findings.

76-0507. Lamoureux, G. L.; Davison, K. L. (U.S. Dep. Agric., Agric., Res. Serv., Metab. Radiat. Res. Lab., State Univ. Station, Fargo, ND 58102). **Mercapturic acid formation in the metabolism of propachlor, CDAA, and fluorodifen in the rat.** *Pestic. Biochem. Physiol.* 5(6): 497-506; 1975. (25 references)

When (^{14}C)F_3-fluorodifen, carbonyl-(^{14}C)CDAA (*N,N*-diallyl-2-chloroacetamide), and carbonyl-^{14}C-propachlor were fed to adult male Sprague-Dawley rats (as a single oral dose of 22 mg/kg in corn oil or 50% ethanol), 57-86% of the ^{14}C was excreted via the urine within 48 hr. Although very little radioactivity was excreted in the feces of the DCAA-treated rats, 15-22% of the ^{14}C was excreted in the feces of the propachlor- and fluorodifen-treated animals. The carcasses of the propachlor- and fluoridifen-treated rats contained 5-11% of the administered radioactivity after 48 hr, while those of the CDAA-treated rats contained only 1.9% of the administered dose. Oxidation of the ^{14}C to (^{14}C)0_2 was not a major process in the metabolism of these herbicides. The only major radioactive metabolite present in the 24-hr urine samples from the fluorodifen-treated rats was 2-nitro-4- trifluoromethylphenyl mercapturic acid; this compound accounted for 41% of the administered dose. In the case of the CDAA-treated animals, the corresponding mercapturic acid accounted for 75% of the administered dose; again, it was the only major metabolite present in the 24-hr urine samples. In contrast, three major metabolites were detected in the 24-hr urine samples from the propachlor-treated rats, the mercapturic acid accounting for only 20% of the administered dose.

76-0508. Leroux, P.; Gredt, M. (Natl. Inst. Agric. Res., Lab. Phytopharm., Versailles, France). **Absorption of methyl benzimidazole-2-yl carbamate (carbendazim) by corn roots.** *Pestic. Biochem. Physiol.* 5(6): 507-514; 1975. (20 references)

The primary roots of corn (*Zea mays* L.) seedlings were bound in a bag of cheesecloth and held in 800 ml of aerated carbendazim solution, after which the roots were washed in aerated water. In roots exposed for 2 hr to solutions containing 2 μg carbendazim/ml, maximal pesticide absorption occurred at pH 5.5-8.5. In the following experiments, the roots were exposed for 5-360 min to solutions containing 2 μg carbendazim/ml (pH 6.4) or 8 μg carbendazim/ml (pH 3.8). Under these conditions, carbendazim was probably taken up passively because the temperature coefficient was low, anaerobic conditions and metabolic inhibitors had little effect, and the rate of absorption was a linear function of the external concentration. In aqueous solutions, carbendazim can exist in the cationic, anionic, or un-ionized (molecular) forms. It appeared that molecular carbendazim was preferentially taken up by the corn roots. Maximal carbendazim absorption generally occurs in the basal portion of the roots, far from the apex.

76-0509. Still, G. G.; Mansager, E. R. (U.S. Dep. Agric., Agric. Res. Serv., Metabl. Radiat. Res. Lab., Fargo, ND 58102). **Alfalfa metabolism of propham.** *Pestic. Biochem. Physiol.* 5(6): 515-522; 1975. (21 references)

Alfalfa shoots (*Medicago sativa* L.) were grown for 7 days in Hoagland's nutrient solution containing 40.0 μM (phenyl-^{14}C)propham. After 7 days of such treatment, the distribution of radioactivity showed 73% in the shoots and 27% in the roots. The shoots and roots were extracted and separated into the polar, nonpolar, and solid residual components using a mixture of chloroform, methanol, and water. The insoluble residues accounted for about 40% of the ^{14}C found in the shoots and roots. The nonpolar fraction (6.1% of the radioactivity) was not chracterized, but was shown to be something other than parent propham. The polar metabolites were partly purified on Amberlite XAD-2 and the cellulase-liberated aglycones were derivatized and separated by high-performance liquid and gas-liquid chromatography. The infrared, nuclear magnetic resonance, and mass spectral data showed that the polar metabolites in the alfalfa plants were glycoside conjugates of isopropyl 2-hydroxycarbanilate (2-hydroxypropham) and isopropyl 4-hydroxycarbanilate (4-hydroxypropham). Conjugated 4-hydroxy-propham accounted for 45.9% of the ^{14}C in the shoots and 3.4% of the ^{14}C in the roots, while conjugated 2-hydroxypropham accounted for 3.4% of the radioactivity in the shoots and 1.4% of that in the roots.

76-0510. Paulson, G. D.; Jacobsen, A. M.; Still, G. G. (Metab. Radiat. Res. Lab., Agric. Res. Serv., U.S. Dep. Agric., Fargo, ND 58102). **Animal metabolism of propham (isopropyl carbanilate): the rate of residues in alfalfa when consumed by rat and sheep.** *Pestic. Biochem. Physiol.* 5(6): 523-535; 1975. (13 references)

Alfalfa was root-treated with (^{14}C)propham for 7 days, then harvested and freeze-dried. Male rats and wether sheep were fed either (^{14}C)-labeled alfalfa roots ((^{14}C)root) or ^{14}C-labeled alfalfa shoots ((^{14}C)shoot). When the (^{14}c)root was given, 6.5-11.0% of the radioactivity was excreted in the urine and 84.6-89.4% was excreted in the feces within 96 hr of treatment. Less than 3% of the ^{14}C remained in the carcass 96 hr after treatment. When (^{14}C)shoot was given, 53.2-55.2% of the radioactivity was excreted in the urine and 32.1-43.4% was excreted in the feces, the carcass containing 0.2-1.1% of the administered doses 96 hr after treatment. When the insoluble fraction of both alfalfa roots and shoots was fed to rats, more than 86% of the radiolabel was excreted in the feces and less than 3% remained in the carcass 96 hr after treatment. The major radiolabeled metabolites in the urine of the sheep fed (^{14}C)shoot were purified by chromatography and identified as the sulfate ester and the glucuronic acid conjugates of isopropyl 4-hydroxycarbanilate. Metabolites in the urine of a sheep treated with (^{14}C)root were tentatively identified as conjugated forms of isopropyl 4-hydroxycarbanilate, isopropyl 2-hydroxycarbanilate, and 4-hydroxyaniline. The combined urine of rats treated with (^{14}C)shoot and (^{14}C)root contained metabolites tentatively identified as conjugated forms of isopropyl 4-hydroxycarbanilate, isopropyl 2-hydroxycarbanilate, and 5-hydroxyaniline.

76-0511. Coppage, D. L.; Matthews, E.; Cook, G. H.; Knight, J. (U.S. Environ. Protect. Agency, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Brain acetylcholinesterase inhibition in fish as a diagnosis of environmental poisoning by malathion, *O,O*-dimethyl *S*-(1,2-dicarbethoxyethyl) phosphorodithioate.** *Pestic. Biochem. Physiol.* 5(6): 536-542; 1975. (38 references)

Brain acetylcholinesterase activities were compared in groups of pinfish (*Lagodon rhomboides*) exposed for 3.5-72 hr to seawater containing sublethal (31 μg/l) and lethal (58-575 μg/l) concentrations of malathion. Lethal exposures caused greater enzyme inhibition than sublethal exposures through 72 hr. Consistent levels of enzyme inhibition (72-79% inhibition) were observed when 40-60% of replicate exposed groups were killed 3.5, 24, 48, and 72 hr after exposures to concentrations of 575, 142, 92, and 58 μg/l, respectively. A mean concentration of 31 μg/l was sublethal through the 72-hr exposure period and caused a maximum enzyme inhibition of only 34%. The correlation of brain acetylcholinesterase inhibition with exposure and deaths is of value in diagnosing poisoning in fish populations and has been applied to actual environmental situations. Enzyme inhibition in fishes was positively correlated with the spray application of malathion to an estuary.

76-0512. Davidek, J.; Seifert, J. (Dep. Food Chem. Anal., Prague Inst. Chem. Technol., Prague, Czechoslovakia). **The interaction of folpet with the glutathione-dependent demethylation enzyme system in rat liver.** *Pestic. Biochem. Physiol.* 5(6): 552-556; 1975. (20 references)

Glutathione and a methanolic solution of fenitrothion were added to rat liver supernatant diluted with 0.15 *M* phosphate buffer. The course of fenitrothion demethylation and its dependence on the substrate concentration was studied, as was the inhibition of the glutathione-dependent demethylation enzyme system by folpet. In a reaction catalyzed by methyltransferase from rat liver in the presence of 0.3 μm glutathion, 0.21 μm of folpet caused a 110% inhibition of the demethylation of 0.2 μm fenitrothion. Phthalimide was formed as the main degradation product of folpet, but the composition of the degradation products of glutathione was dependent on the molar ratio of the reactants. Compounds absorbing at 267 nm—probably derivatives of 2-thiazolidinethiones—were formed when the ratio of glutathione to folpet was 4.5:1. When this ratio was reversed, oxidized glutathione was the main product. The results suggest that in the enzyme demethylation system, the reaction between fungicide and glutathione predominates.

76-0513. Chadwick, R. W.; Chuang, L. T.; Williams, K. (Environ. Protect. Agency, Natl. Environ. Res. Cent.,

Pesticides Toxic Substances Effects Lab., Research Triangle Park, NC 27711). **Dehydrogenation: a previously unreported pathway of lindane metabolism in mammals.** *Pestic. Biochem. Physiol.* 5(6): 575-586; 1975. (62 references)

Evidence for the hydrogenation of lindane by a hepatic microsomal mixed-function oxidase system is presented. Preliminary investigation indicated that the incubation of lindane with rat liver homogenates produces a chlorinated, nonpolar compound identified as hexachlorocyclohexane (BHC). Differential centrifugation resulted in the sedimentation of most of the dehydrogenase activity in the microsomal fraction. Optimum in vitro assay conditions were established and it was found that the dehydrogenase system required molecular oxygen and reduced pyridine nucleotide coenzyme for maximum activity. Inhibition by SKF 525-A and CO suggested that the enzyme is cytochrome P-450-dependent, whereas lack of inhibition by cyanide indicated that the cytochrome b_5 desaturase system was probably not involved. Pretreatment of rats with DDT (2 mg DDT/day for 2 weeks, p.o.) stimulated lindane metabolism and induced significantly higher dehydrogenase activity. Both the in vivo and in vitro metabolism of hexachlorocyclohexene produced previously identified lindane metabolites. The existence of a cytochrome P-450-dependent mixed-function oxidase which catalyzes the dehydrogenation of lindane has not previously been reported and may be of importance in the metabolism of other xenobiotics.

76-0514. Waring, R. H.; Wolfe, M. S. (Dep. Biochem., Univ. Birmingham, Cambridge, England). **Distribution of tridemorph and its metabolites in barley plants grown to maturity.** *Pestic. Sci.* 6(2): 169-172; 1975. (5 references)

Barley cultivars were sprayed with labeled (tritiated) tridemorph at growth stage 30 and harvested at full ripeness, about 12 weeks later. The tridemorph was applied at the manufacturer's recommended field rate. The plants were dissected into component parts and analyzed by paper and gas-liquid chromatography. Labeled material was found in all parts of the plant, about 10% of the original spray being recover after harvest. Most of the radioactivity (85-90%) in the stem was found in the nodes and most of that in the leaves occurred in leaf 2. In addition, about 1-6% of the applied tridemorph was firmly bound to the plant tissue. The mean tridemorph and tridemorph metabolite concentrations in the different components of the mature Proctor barley plants were: seeds, 0.85 and 0.04 μg; awns, 0.68 and 0.43 μg; leaves, 0.73 and 0.21 μg; rachis, 0.13 and 0.26 μg; and stem, 0.98 and 0.38 μg, respectively. The residue levels in the grains were variety-specific, the highest levels being found in the Sultan and Proctor varieties and the lowest levels being found in the Midas and Golden Promise varieties; intermediate levels were found in the HB 551/48 and Maris Canon varieties.

76-0515. Jennings, D. M.; Bunyan, P. J.; Brown, P. M.; Stanley, P. I.; Jones, F. J. S. (Pest Infest. Contr. Lab., Min. Agric. Fish. Food, Tolworth, Surbiton, Surrey, England). **Organophosphorus poisoning: a comparative study of the toxicity of carbophenothion to the Canada goose, the pigeon and the Japanese quail.** *Pestic. Sci.* 6(3): 245-257; 1975. (16 references)

The acute single dose oral toxicity of carbophenothion (*S*-4-chlorophenylthiomethyl *O,O*-diethyl phosphorodithioate) has been determined in Canada geese (*Branta canadensis*), pigeons (*Columba livia*) and Japanese quail (*Coturnix coturnix japonica*). At post mortem examination gross pathological changes were observed in Canada geese and pigeons. Esterase levels were determined by conventional and electrophoretic methods on extracts of liver and brain from these two species. Carbophenothion residues were detected in liver, brain, and gizzard contents from the geese and pigeons. The overall pattern of results suggests that esterase inhibition may not be the dominant factor in carbophenothion poisoning in geese. It is suggested that a brain carbophenothion residue level of 1 part/10^6 is indicative of death by poisoning in geese. (Author abstract by permission)

76-0516. Haddock, E.; Jordan, D.; Sampson, A. J. (Shell Res. Ltd., Sittingbourne Res. Center, Sittingbourne, Kent, England). **The development of flamprop-isopropyl--a new wild oat herbicide for use in barley.** *Pestic. Sci.* 6(3): 273-281; 1975. (10 references)

Flamprop-isopropyl, isopropyl (±)-2-[*N*-(3-chloro- 4- fluorophenyl) benzamido]- propionate, has been shown to give good control of *Avena* spp. in barley. Results from glasshouse tests have been confirmed in field trials over two seasons, in 8 European countries, using a 200 g/liter formulation of the herbicide. In Spring barley the crop stage during which application should be made for optimum weed control and crop benefit lies between late tillering and the formation of the second node. The acute oral toxicity is represented by the following LD50 values at 20% in dimethyl sulfoxide: rat, > 3000 mg/kg; mouse, > 2500 mg/kg; and poultry, > 1000 mg/kg. (Author abstract by permission, supplemented)

76-0517. Reading, C. M.; Arscott, G. H.; Tinsley, I. J. (Dep. Poultry Sci., Oregon State Univ., Corvallis, OR 97331). **Effect of dieldrin and calcium on performance on adult Japanese quail.** *Poultry Sci.* 54(5): 1808; 1975.

Two experiments were conducted to determine the effects of dieldrin and calcium on reproduction. Quail received diets containing 0, 10 or 25 ppm of dieldrin for six, 28-day periods in experiment 1 and 0, 5, 10 or 25 ppm of dieldrin for four, 28-day periods in experiment 2. Pesticide treatments were employed with diets containing 0.5% and 3.0% Ca. The results show that eggshell thickness, cracked eggs, egg production, feed consumption, egg weights, fertility, hatchability, and body weights were not affected by dieldrin treatments. However, eggshell thickness, cracked eggs, egg production and hatchability were

adversely affected by the lower Ca level. Female body weights were consistently heavier for the low Ca diet. Mortality increased in the presence of 10 and especially 25 ppm of dieldrin. Livability of chicks from hens receiving rations with 10 and 25 ppm of dieldrin was significantly lower than those fed no dieldrin. In summary, dieldrin was without effect on egg shell quality or other reproductive factors but did exert a detrimental effect on adult mortality and livability of progeny. (Author abstract by permission)

76-0518. Wyrobek, A. J.; Bruce, W. R. (Ontario Cancer Inst., Toronto, Ontario, Canada). **Chemical induction of sperm abnormalities in mice.** *Proc. Natl. Acad. Sci. USA* 72(11): 4425-4429; 1975. (97 references)

Measurements of sperm abnormalities are reported in mice following the administration of 25 diverse chemical agents thought to represent a range of mutagenic, teratogenic, and carcinogenic activities. Of these 25 agents, some were aminopterin, dichlorvos, DDT, trimethylphosphate and urethane. The sperm of (C57BL X C3H)F_1 mice were examined at 1, 4, and 10 weeks after a subacute treatment with one of the chemicals at 2 or more dose levels. The fraction of sperm that were abnormal in shape was elevated above control values of 1.2-3.4% for dichlorvos, aminopterin, and trimethylphosphate. Urethane and DDT did not induce elevated levels of sperm abnormalities. The results of this study suggest that sperm abnormalities may provide a rapid inexpensive mammalian screen for agents that lead to errors in the differentiation of spermatogenic stem cells in vivo and thus indicate agents which may prove to be mutagenic, teratogenic, or carcinogenic.

76-0519. Varela, G.; Torralba, A.; Escriva, J. (Nutr. Dep., Patronate Juan del al Cierva, CSIC Vet. Fac., Madrid 3, Spain). **Influence of prolonged ingestion of some organochlorated pesticides on digestibility and nutritive value of a diet in rats.** *Proc. Nutr. Soc.* 34(2): 93A-94A; 1975. (2 references)

The effects were studied of lindane (10 mg/kg), DDT (0.5 and 10 mg/kg), and dieldrin (0.5 and 10 mg/kg) added to the diet of Wistar rats. Each group of rats received the treated diet for 3 months. The results of this study showed that with the 0.5 mg DDT/kg dose the digestibility of fat was significantly diminished. With the 10 mg/kg DDT dose, the decrease was greater. Dieldrin had a similar effect, the 0.5 mg/kg dose causing a decrease in the digestibility of fat with the larger dose causing a greater decrease in digestibility. Lindane had no effect on the digestibility of fat. No effect on the digestibility of the remaining nutrients, net protein utilization, or total digestible nutrients, was observed.

76-0520. Bellward, G. D.; Dawson, R.; Otten, M. (Div. Pharmacol. Toxicol., Fac. Pharm. Sci., Univ. British Columbia, Vancouver, British Columbia, Canada). **The effect of dieldrin-contaminated feed on rat hepatic microsomal epoxide hydrase and aryl hydrocarbon hydroxylase.** *Res. Commun. Chem. Pathol. Pharmacol.* 12(4): 669-684; 1975. (22 references)

The effects of dieldrin on the epoxide hydrase (EH) and aryl hydrocarbon hydroxylase (AHH) activities were investigated in male Wistar rats. The rats were fed ad libitum 5, 10, 15, 20, or 25 ppm dieldrin mixed with their food. In preliminary studies the effects of 2 classic inducers, phenobarbital and 3-MC, were studied. Pretreatment with either 40 or 60 mg/kg phenobarbital produced a significant increase in enzyme activity over controls. Five days of pretreatment with 40 mg/kg caused a 41% increase over control levels. The administration of 3-MC p.o. produced a 50% increase in EH activity. However, 3-MC administered i.p. did not significantly increase the enzyme activity. SKF 525-A did not cause any significant change in enzyme activity at either 35 or 50 mg/kg i.p. doses. After one week, EH activity was increased as a function of the concentration of dieldrin in the feed, by 19%, 20%, and 43%, for the 5, 10, and 20 ppm levels, respectively. In additional experiments animals were exposed to rations containing 25 ppm dieldrin for various time periods. Although large variations in the activity of EH were noted in each group, significant elevations of activity were apparent after 4-7 days exposure to dieldrin. The elevation in activity began to decline after 23 to 30 days of exposure. Phenobarbital pretreatment had little or no effect on AHH. However, 3-MC caused a large elevation of activity. SKF 525-A produced large decreases in AHH activity. No change in AHH activity over controls occurred at any dose or duration of dieldrin feeding. In dieldrin vs. aldrin experimentation, i.p. pretreatment with 10 mg/kg dieldrin for 2 and 4 days increased EH activity 28 and 19%, respectively. Enzyme activity was about 24% higher than controls in groups treated for 2 days with either analytical grade dieldrin or analytical aldrin. No significant differences were noted between treatment groups. Determinations of microsomal cytochrome P-450 were made in animals fed either control or 20 ppm dieldrin rations for 7 days. Cytochrome P-450 levels in the treated groups were 39% higher than in controls. The in vivo effects of dieldrin on pentobarbital sleeping time were measured in rats given 20 ppm dieldrin contaminated ration for 7 days. The average sleeping time of the dieldrin treated group was 61% of the control group. The results of this study allow the conclusion that, when male rats were pretreated with dieldrin under the described conditions, an increase in the activity of epoxide hydrase occurred with no change in the activity of benzpyrene hydroxylase. Slight, but significant, increase in the amount of cytochrome P-450 were noted, together with a decrease in pentobarbital sleeping time.

76-0521. Ludwicki, J. (Dep. Food Anal., Nat. Inst. Hyg., Warsaw, Poland). Wplyw wybranych substancji na enzymy fracji lizosomalnej watroby szczura. Cz. II. Badania in vivo. [**Effect of selected compounds on the enzymes in lysosomal fraction of rat liver. II. Investigation in**

vivo.] *Rocz. Panstw. Zakl. Hig.* 26(5): 557-566; 1975. (11 references) (Pol.)

The influence of four insecticides, aldrin, dieldrin, endrin, and endosulfan, was studied on the stability of lysosomal membranes and activity of enzymes of lysosomal origin. The results showed that there was an increased free activity of β-glucuronidase and acid phosphatase. No changes in total activities of these enzymes were noted. It is suggested that this phenomenon was caused by disruption of lysosomal membranes and the release of the bound activity into the cytoplasm. In tests on pure, commercial β-glucuronidase and acid phosphatase, two of the three detergents also tested showed a decrease in activities of these enzymes. This inhibition was a noncompetitive one.

76-0522. Syrowatka, T.; Jurek, A. (Dep. Toxicol. Sanit., Nat. Inst. Hyg., Warsaw, Poland). Wystepowanie i toksycznosc polichlorowanych pochodnych dwubenzo-p-dwuokysyny, dwubenzo-furanu i nat talenu. [**Incidence and toxicity of polychlorinated derivatives of dibenzo-*p*-dioxin, dibenzofuran, and naphthalene.**] *Rocz. Panstw. Zakl. Hig.* 26(5): 623-634; 1975. (39 references) (Polish)

The incidence and toxicity were studied of trace contaminants such as chlorinated dibenzo-*p*-dioxins and dibenzofurans in various chlorinated technical substances. It was found that 2,4,5-trichlorophenol, 2,4,5-T, and polychlorinated diphenyls such as Phenoclor DP6 and Clophen A60 were indeed contaminated with these trace chemicals. The chemicals, as well as other chlorinated substances, may cause chloracne, liver diseases, teratogenicity, disease X in cattle, or edema in chicken. Chlorinated dibenzo-*p*-dioxins and dibenzofurans, especially 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, are very toxic to several animal species. Their toxic action takes place mainly in the hemopoietic system and the liver. The derivation of these substances from their precursors is discussed.

76-0523. Watari, N. (First Sch. Anat., Fac. Med., Nagoya Munic. Univ., Nagoya, Aichi, Japan). [**Cell alterations following BHC administration.**] *Saibo (Cell)* 7(3): 186-199; 1975. (30 references) (Japanese)

Short term administration of γ-BHC (lindane) (0.15% solution in rapeseed oil was performed) by i.m. injection at 0.1 and 0.2 ml/day for seven days. Long term p.o. administration of γ-BHC at 1 ppm in potable water, 4-5 ml./day) for 1, 3, 4, 6, 7, 10, and 12 months were carried out on male ddy mice. The first group was sacrificed on the 8th day. Another experiment was carried out with short term administration: 1 mg of glycyrrhizin was administered i.m. once a day for 7 days. BHC, even at a very low dosage, caused severe cell lesions in the mouse liver and the pancreatic exocrine and endocrine cells. It was found that the liver was attacked repeatedly by BHC in the blood circulation, producing injuries resulting in possible carcinogenesis. The pancreas was severely attacked due to the lack of detoxication function, resulting in irreparable damage and diabetes. It was further found that glycyrrhizin could prevent liver damage due to BHC.

76-0524. Epstein, S. S. (Med. Sch., Case Western Reserve Univ., Cleveland, OH). **The carcinogenicity of dieldrin. Part II.** *Sci. Total Environ.* 4(3): 205-217; 1975. (19 references)

Information regarding the carcinogenicity of dieldrin is presented in support of the cancellation hearings. The data presented allows that first, as regards the definition of the term carcinogen, any agent which is conclusively shown to increase the incidence or shorten the latency of tumor induction in man or animals must be labeled a carcinogen. Second, the demonstrated variability in the spontaneous appearance of tumors in the livers of mice offers no problem to the demonstration of dieldrin-induced carcinogenicity in this organ or in others. Third, it is suggested that tests of dieldrin be carried out in infant animals, since it is known that infant animals are more susceptible to chemical carcinogens than humans, and since it is known that human infants are exposed to a relatively high concentration of dieldrin. Fourth, as it has been demonstrated that the incidence of tumors in the mouse is dependent on a period of early exposure, any prolongation of current exposure for humans increases the degree of carcinogenic hazard. Fifth, the fact that public exposure to the carcinogen is involuntary, occurring through such sources as food, water, and environmental factors, is stressed. It is concluded that there are cogent scientific grounds to demonstrate that continued exposure of human populations to dieldrin constitutes an "imminent hazard"

76-0525. Lay, M. M.; Hubbell, J. P.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Dichloroacetamide antidotes for thiocarbamate herbicides: mode of action.** *Science* 189(4199): 287-289; 1975. (14 references)

Thiocarbamate sulfoxides formed on metabolic sulfoxidation of thiocarbamate herbicides in plants and mammals are effective carbamoylating agents for glutathione and other tissue thiols. Dichloroacetamides that protect corn from thiocarbamate herbicide injury induce more rapid detoxification of the thiocarbamate sulfoxides by increasing their rate of carbamoylation of glutathione through elevation of the root glutathione level and glutathione *S*-transferase activity. (Author abstract by permission. Copyright 1975 by the American Association for the Advancement of Science)

76-0526. DeBaun, J. R.; Menn, J. J. (Biochem. Dep., Mountain View Res. Ctr., Stauffer Chem. Co., Mountain View, CA 94042). **Sulfoxide reduction in relation to organophosphorus insecticide detoxication.** *Science* 191(4223): 187-188; 1975. (8 references)

Carbophenothion sulfoxide, an oxidative metabolite of carbophenothion, is reduced to carbophenothion in the living rat and by an in vitro system containing rat liver enzyme, reduced nicotinamide adenine dinucleotide phosphate, and flavin adenine dinucleotide phosphate. Reduction of sulfoxide, formed metabolically from certain commercial organophosphorus insecticides, may be important in ameliorating the toxicity of these compounds. (Author abstract by permission. Copyright 1975 by the American Association for the Advancement of Science)

76-0527. Timme, A. H.; Taljaard, J. J. F.; Shanley, B. C.; Joubert, S. M. (Dep. Pathol., Univ. Cape Town, Cape Town, South Africa). **Symptomatic porphyria. Part II. Hepatic changes with hexachlorobenzene.** *South Afr. Med. J.* 48(43): 1833-1838; 1974. (12 references)

The ultrastructural changes are described as observed in the livers of rats exposed to hexachlorobenzene. One group of rats was made siderotic by i.p. injections of Imferon (5 injections of 10 mg each). A second group received no supplementary iron. Both groups were fed normally for 2 months before starting feeding with hexachlorobenzene (HCB) given as a 0.3% mixture with rat chow. Neurological signs such as tremor were noted soon after the HCB feeding started. A rise in urinary porphyrins occurred in both groups, but was earlier in the siderotic group. In the non-siderotic group, livers contained only traces of stainable iron after HCB feeding. In the siderotic group the iron was initially diffuse in the lobule, but later the centrilobular areas contained only minimal quantities. Red porphyrin fluorescence first appeared in the centrilobular zone in both groups, but in the siderotic group it became widespread throughout the lobule. The development of gross cytoplasmic vacuolation and the formation of cytoplasmic inclusions were noted. Some of the inclusions consisted of slender tubular structures about 0.02 μm in diameter. It was felt that these inclusions represented precipitated porphyrins, but this could not be definitely established. The administration of iron prior to the feeding of HCB resulted in more extensive development of liver lesions and it is suggested that this could account for the higher levels of excreted porphyrins in the iron-laden animals.

76-0528. Shirasu, Y. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). **Mutagens and teratogens.** *Teratology* 12(2): 189-190; 1975.

The relationship between mutagenicity and teratogenicity of chemical substances has been debated, whereas correlation between mutagenicity and carcinogenicity has been clarified by recent advances in mutation and cancer research fields. In this lecture the relationship between mutagenicity and teratogenicity is discussed in relation to recent findings and past reports. As an example, the relationship between mutagenicity and teratogenicity of ethylenethiourea (ETU) is to be discussed. ETU is one of the degradation products of ethylenebis- dithiocarbamate fungicides such as zineb and maneb. This compound has been shown to induce tumors in rats and mice and also to possess teratogenicity in rats. Our mutagenicity studies on ETU consisted of microbial, cytogenetic, and dominant lethal test systems. The microbial studies revealed a weak mutagenicity of ETU only in *S. typhimurium* TA1535, although no mutagenic activities were found in TA1536-8 series, *E. coli* WP2 series and in the Rec-assay system. *In vitro* cytogenetic studies using chinese hamster DON cells gave negative results. *In vitro* cytogenetic analysis on the bone marrow cells of rats revealed no chromatosomal aberrations. The results of dominant lethal studies in mice were negative. Studies on teratogenicity of ETU confirmed potent teratogenic activities in rats as reported at this meeting. There seems no clear correlation between the mutagenicity and teratogenicity of ETU. Relationship between mutagenicity and teatogenicity will be discussed further on other pesticides and related chemical substances. (Author abstract by permission, edited)

76-0529. Matsumoto, N.; Iijama, S.; Katsunuma, H. (Dep. Public Health, Fac. Med., Univ. Tokyo, Tokyo, Japan). **Fetal body burden of chemicals and its effect on fetal growth.** *Teratology* 12(2): 203; 1975.

In order to clarify the role of the spiral torsion of the bulbar ridges in the early development of the cardiovascular system, horizontal serial sections of epon-embedded rat fetal hearts were examined after administration of ^{3}H-thymidine into the maternal abdominal cavity. The fetal hearts were taken from animals irradiated with neutrons on the eighth day of gestation, and from non-irradiated controls. The left ventral bulbar ridge was larger than the right dorsal one on the 12th and 13th days of gestation in the non-irradiated group. The labeling index by histoautoradiography, however, was higher in the right dorsal bulbar ridge. On the 14th and 15th days these labeling differences disappeared with fusion between the left and right bulbar ridges, and with increasing numbers of dead cells in these areas. The bulbar ridges of a heart with dextrocardia in the irradiated group showed reversed torsion. Abnormal forms and non-torsion of the bulbar ridges were further observed in other abnormal hearts. The labeling index in the irradiated group was lower than in the non-irradiated group. In conclusion, it is suggested that the spiral torsion of the bulbar ridges may play an important role in the cardiovascular development, and the changes of cell proliferation and abnormal form of the bulbar ridges may induce cardiovascular anomalies. (Author abstract by permission)

76-0530. Teramoto, S.; Kaneda, M.; Shirasu, Y. (Inst. Environ. Toxicol., Kodraira, Tokyo, Japan). **Teratogenicity of ethylenethiourea in rats. I. Relationship of dosage and time of administration to types of malformation.** *Teratology* 12(2): 215-216; 1975.

Ethylenethiourea (ETU) is one of the degradation

products of ethylenebis-dithiocarbamate fungicides, such as maneb and zineb, which have been widely used on food crops. In order to evaluate relationship of the dosage and the treatment stage to the spectrum of malformation single oral doses ranging from 50 to 200 mg/kg of ETU were administered to Wistar-Imamichi rats between day 6 and day 14 of pregnancy (sperm found-day 0) and fetuses were examined for external, skeletal and internal anomalies on day 20 of pregnancy. No embryocidal effect was noted under the conditions of this experiment. Although no anomalies were found on day 6 through 8, administration of ETU on day 9 or later resulted in severe congenital malformations such as meningocele, micrognathia, cleft plate, anal atresia, shortening of the tail, and hypoplastic digits in external appearances. Types of malformation varied with the treatment stages. With the increasing dosage, there was an increase in incidences and an elongation of the critical period for the malformations. The critical period was similar to that for other teratogens such as X-rays and antitumor agents. (Author abstract by permission)

76-0531. Teramoto, S.; Shingu, A.; Kaneda, M.; Saito, R.; Harada, T.; Kato, Y.; Shirasu, Y. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). **Teratogenicity of ethylenethiourea in rats. II. Mode of teratogenic action.** *Teratology* 12(2): 216; 1975.

Administration of ethylenethiourea (ETU) to pregnant rats was shown to induce severe defects in the central nervous system of the fetuses. After oral administration of 100 mg/kg of ETU to Wistar-Imamichi rats on day 12 of pregnancy (sperm found-day 0), fetuses were examined microscopically. Histological examination revealed an extensive cell necrosis in the neural tube at 24 hours after treatment of the mothers. Although rosette formation of regenerating cells was noted at 48 hours or later, development of differentiation of the brain remained inhibited. Evaluation of transplacetnal passage was made with ^{14}C-ETU under the same experimental conditions. Concentration of ETU in the maternal blood, tissues and fetuses was maximum at 2 hours after the treatment (approximately 4 μg/fetus). On the other hand, intra-amniotic injection of 200 μg of ETU on day 12 of pregnancy failed to induce any malformations. It is considered, therefore, that the anomalies in the central nervous system observed in the term fetuses were mainly caused by the extensive cell necrosis in the neural tube at the earlier state of the fetal development but not by the direct action of ETU on the affected organs. (Author abstract by permission)

76-0532. Weis, J. S.; Weis, P. (Dep. Zool. Physiol., Rutgers Univ., Newark, NJ 07102). **Retardation of fin regeneration in *Fundulus* by several insecticides.** *Trans. Am. Fish. Soc.* 104(1): 135-137; 1975. (14 references)

Experiments were conducted to determine the effects of DDT, malathion, parathion, and sevin (carbaryl) on the regeneration rate of teleost fins. Killifish, *Fundulus heteroclitus*, were used in this study. The insecticides were introduced as acetone solutions into experimental aquaria at the concentration of 10 μg/liter (10 ppb). All 4 insecticides studied retarded regeneration to some extent. DDT, however, produced retardation only after 2 weeks. It is suggested that this finding may reflect different degrees of damage by the different insecticides, or that it may also reflect differences in their modes of action. The effect of DDT may be limited to a slowing down of the growth rate once regeneration has started. Such activity would be attributed to its general toxicity rather than to any specific effect as by 2 weeks time the animals would have a considerable amount of this persistent insecticide in their tissues. Sevin, and to a greater extent malathion and parathion, caused retardation in the first week of the study which may reflect a retardation of the initial stages of blastema formation as well as the subsequent growth of the regenerate. Regardless of the mode of action, each of these insecticides retarded regeneration of caudal fins to some extent. This retardation may not be a result of interference with neural activity, but could be considered another parameter of insecticide toxicity. If such retardation of regeneration occurs in nature, it is possible that susceptibility to predation could be increased.

76-0533. Balashova, E. K.; Pevzner, D. L.; Rozengart, V. I.; Sherstobitov, O. E. (I. M. Sechenov Inst. Evolut. Physiol. Biochem., Acad. Med. Sci. USSR, Leningrad, USSR). **Gidrofbonost' fosfororganicheskikh ingibitorov kholinesterazy i nekotorye osobennosti ikh raspredeleniya v organizme. [Hydrophobic properties of cholinesterase organophosphorus inhibitors and some peculiarities in their distribution in the body.]** *Ukr. Biokhim. Zh.* 46(3): 312-316; 1974. (13 references) (Russian)

The hydrophobic properties and organ distribution were studied of three *O*-alkyl-*S*-hexylthiophosphonate derivatives (GA-89, GA-71, and GA-95). The distribution coefficient for the hexane-water system sharply increased with increasing length of the hydrocarbon radical in the *O*-alkyl group. The ability of the erythrocytes to reversibly bind these substances increased with increasing length of this hydrocarbon radical, and did not correlate with the phosphorylating ability or with the cholinesterase inhibiting activity, which indicates that these organophosphorus cholinesterase inhibitors are reversibly absorbed on the surface of the erythrocytes. After i.v. injection to rabbits, the levels of the organophosphorus compounds fell rapidly in the blood, and they were eliminated totally within 20 min. While their levels in the organs were below the limit of detectability, very high concentrations were found in the lungs. The levels of the less hydrophobic preparation GA-89 were five times lower than that of the more hydrophobic GA-95. The elimination from the lungs was accelerated by perfusion. The findings indicate that organophosphorus cholinesterase inhibitors are sorbed reversibly on the endothelium of the capillaries rather than in the cells of the pulmonary epithelium.

76-0534. Vikandrov, V. N. (Belorussian Sci. Res. Inst. Vet. Med., Minsk, USSR). **Intensivnost' pereaminirovaniya s aspartata na alpha-ketoglutarat v tkanyakh krys pri vliyanii 2-metil- 4-khlorfenoksi-gamma-maslyanoy kisloty. [Intensity of reamination from aspartate for alpha-ketoglutarate in rat tissues as affected by 2-methyl- 4-chlorphenoxy gamma-butyric acid.]** *Ukr. Biokhim. Zh.* 46(3): 364-367; 1974. (10 references) (Russian)

The intensity of reamination from aspartate of α-ketoglurarate was studied in the brain, muscle tissue, and liver of Wistar rats poisoned with single oral 1,570 mg/kg (LD16) and 785 mg/kg doses of 2-methyl-4-chlorophenoxy γ-butyric acid. The animals were decapitated 1,3 and 6 hr after poisoning. A tendency toward increased overall aspartate aminotransferase activity in the brain was observed during the first 3 hr after poisoning with the 1,570 mg/kg dose due to the increasing activity of the free enzyme. Reduction of the overall activity was observed after 6 hr. The bound form of the enzyme was inhibited starting from the third hr. The increased rate of transamination in the liver was due to the increased activity of the bound enzyme after 3 hr, while this bound enzyme was inhibited after 1 and 6 hr. Activation of the free enzyme and considerable inhibition of the bound form were observed in the muscles at all intervals. The smaller dose intensified the tranamination in the brain during the first hour due to the increased activity of both the free and bound enzymes. The inhibition of the overall activity, observed after 6 hr, was due to the reduced activity of the bound enzyme. The activity changes in the liver were moderate: starting from the third hour, the activity of the bound form of the enzyme decreased, and that of the free form increased. Increase in the overall enzyme activity after 3 hr and inhibition after 6 hr due to inhibition of the free form of the enzyme were observed in the muscles.

76-0535. Goncharenko, N. G. (Dept. Pestic. Toxicol., Kiev Sci. Res. Inst. Ind. Hyg. Occup. Diseases, USSR). **O toksichnosti abata pri ingalyatsionnom postuplenii v organizm. [Toxicity of abate during inhalation entrance into the organism.]** *Vrach. Delo* 9: 130-133; 1975. (Russian)

The acute and chronic toxicity of inhaled abate (temephos) was studied in rats and cats. The oral LD50 had been determined to be 1,650 mg/kg in rats and 460 mg/kg in mice. The LD50 after skin application was found to be 1,200 mg/kg in rats. Weak cumulation was observed. Acute inhalation tests with 4 hr exposure time revealed that a 25 mg/m³ concentration is a threshold concentration for rats and cats. The acute toxic concentration, causing pronounced reduction of the cholinesterase activity, reduced phagocytic activity of the neutrophils and decreased bactericidal power of the skin, was determined to be 40 mg/m³. Prolonged exposure to the chronic threshold concentration of 3.2 mg/m³ caused periodic reductions of the cholinesterase activity and reduced the phagocytic activity of the neutrophils and the phagocytosis index. The chronic toxic concentration was found to be 12.9 mg/m³. Neurocytes with peripheral chromatolysis and edema of the renal and hepatic parenchyma were observed in animals exposed to this concentration. The maximum allowable concentration in the air of working zones is 0.5 mg/m³. The findings indicate moderate toxicity of abate.

76-0536. Vaicum, L.; Eminovici, A. (Res. Design Inst. Water Resources Engin., Bucharest, Romania). **The effect of trinitro-phenol and α-hexachlorocyclohexane on the biochemical characteristics of activated sludge.** *Water Res.* 8(12): 1007-1012; 1974. (9 references)

The composition of activated sludge was studied, especially with respect to the nature and content of intracellular proteins. Three laboratory scale activated sludge units were operated over a 3-mo period and various compositional and activity measurements were made. Following this period of steady-state operation, various amounts of trinitrophenol, acrylonitrile, methyl violet, trichlopropane, and lindane were fed into the units and the measurements were done again. Lindane added in concentrations of 1 and 5 mg/l did not modify the treatment efficiency, but a concentration of 10 mg/l lowered this efficiency by about 20%. At this concentration, lindane produced a reduction (from 40% to 22%) in protein and dehydrase activity (from 12.5 γ/mg/hr to 4.4 γ/mg/hr) and an increase in glucides (from 8% to 16.9%) and catalase activity (from 101.32 to 179.3 lg-¹/sec) in the activated sludge.

76-0537. Pestemer, W.; Beckmann, E. O. (Inst. Nutzpflanzenforsch., Tech. Univ., Berlin, Germany). **Zur Wirkung von Linuron in einem Boden mit unterschiedlicher Humusversorgung. [Effects of linuron in soils with different levels of organic fertilizer supplied.]** *Z. Pflanzenkr. Pflanzensch.* 82(2): 109-121; 1975. (9 references) (German)

Linuron activity was evaluated in a potted soil, loamy sand with pH 6.8, after long-term treatment with organic fertilizer, green compost, or farmyard manure under both field and greenhouse conditions. The carbon content of the soil ranged from 1.4 to 2.2% and clearly determined the adsorption and thus also the decomposition and herbicide effectiveness which was dependent on the nonadsorbed fraction. The herbicide was more active in soil additionally supplied with organic manure. As the herbicide became more effective, the dehydrogenase activity was decreased. In soil enriched with flue dust at a carbon concentration of 11%, the herbicide adsorption was also strongly dependent on the carbon. However, the poor carbon quality allowed only a low biological activity as measured by dehydrogenase activity.

See also **76-0321 76-0387 76-0583**

76-0538. Makeeva-Gur'yanova, L. T.; Spiridonov, Yu. Ya.; Klimenko, A. A. (All-Union Sci. Res. Inst. Phytopathol., Bol'shye Vyazemy, Moscow Region, USSR). **Kolorimetricheskiy metod opredeleniya gerbitsida piklorama v pochve. [Colorimetric method for the determination of the herbicide picloram in soil.]** *Agrokhimiya (Moscow)* 8: 142-147; 1975. (15 references) (Russian)

An improved version of Cheng's method for the colorimetric determination of picloram in soil is described. Extraction is done with potassium chloride, and a pH 7 buffer solution, composed of monobasic potassium phosphate and dibasic sodium phosphate, is added to neutralize acid soils. The extract is centrifuged and the supernatant is filtered to remove impurities. Then the filtrate is acidified to pH 2 with concentrated sulfuric acid and picloram is extracted with ethyl ether. The dehdyrated ether extract is filtered through filter paper and the dry residue is taken up in 0.1 *N* potassium hydroxide. The diazotization reaction was initiated with 4*N* sulfuric acid, after which 0.5*M* solution of sodium nitrite is added. The coloration thus obtained is stable in UV light for 6 hr. The extinction of the solution is measured at 405 nm. The sensitivity of the method amounts to 0.5 mg/kg. At an error of 2-8%, the recovery rate varies between 65 and 95%.

76-0539. Talmi, Y.; Bostick, D. T. (Oak Ridge Natl. Lab., Oak Ridge, TN 37830). **Determination of alkylarsenic acids in pesticide and environmental samples by gas chromatography with a microwave emission spectrometric detection system.** *Anal. Chem.* 47(13): 2145-2150; 1975. (17 references)

The applicability is described of a gas chromatograph with a microwave emission spectrometer detector (GC-MES) to be used in the determination of alkylarsenic acids in commercial pesticides. The procedure calls for the $NaBH_4$ reduction of the arsenic acids to the corresponding arsines, followed either by extraction of these arsines or by their flushing from the sample solution and collection in cold toluene at -5°C. After extraction, the arsines are separated on a GC column and determined by a MES detector by measuring the emission intensity of the AS 228.8-nm spectral line. Reduction conditions, sample volume, losses due to volatilization, and arsine rearrangement side reactions affect the production and collection of the arsines. Instrumentation parameters, such as column operation and microwave power, are discussed. Mass spectrometry was used to positively identify the various alkylarsines separated on the GC column. As the MES detector is highly selective to arsenic, the absolute sensitivity, 20 pg of arsenic, is very little dependent on the molecular structure of the arsines. The relative sensitivity for water samples is at least 0.25 μg/l. The present analytical method can thus be used to determine arsenic acids as either major, minor, or trace compounds.

76-0540. Giam, C. S.; Chan, H. S.; Neff, G. S. (Dep. Chem., Texas A & M Univ., College Station, TX 77843). **Sensitive method for determination of phthalate ester plasticizers in open-ocean biota samples.** *Anal. Chem.* 47(13): 2225-2229; 1975. (16 references)

A study was undertaken to establish methodology necessary for the determination of phthalate levels in open-ocean biota. The use of gas chromatography (GC) with an electron capture detector (ECD) provided the basis for a newly developed, very sensitive, method for the detection of phthalate ester plasticizers in such samples. Chlorinated hydrocarbons, such as DDT and its derivatives, and the polychlorinated biphenyls which are present in almost all marine biota samples interfere with the ECD-GC analysis of the phthalates. Prior to GC a separation of these compounds must be obtained. This separation can be achieved with column chromatography on deactivated (3% water) Florisil. The background contamination had to be reduced to levels much lower than had previously been done as the amount of phthalates anticipated in the samples to be studied was very small. By means of very careful decontamination of all reagents and equipment and precautions to avoid recontamination during the procedure, background levels as low as 25 ng of dibutyl phthalate and 50 ng of di-2-ethylhexyl phthalate were attained. Results of a typical biota analysis are given with an average of approximately 5 ppb of di-2-ethylhexyl phthalate.

76-0541. Giam, C. S.; Chan, H. S.; Neff, G. S. (Dep. Chem., Texas A & M Univ., College Station, TX 77843). **Rapid and inexpensive method for detection of polychlorinated biphenyls and phthalates in air.** *Anal. Chem.* 47(13): 2319-2320; 1975. (11 references)

This paper describes a simple, inexpensive, and sensitive method for the determination at low levels (ng/m^3) of not only specific phthalate esters but also of PCBs and DDT in air. As di(2-ethylhexyl)phthalate (DEHP) is one of the more persistent contaminants, preliminary experiments were conducted using it as the test compound. A series of five 1-cm columns of Florisil prepared in Pasteur pipets were connected in sequence. Air was drawn through 25 ml of DEHP into the columns at 750 cm^3/min for 6 days. After this time, only the first column adjacent to the DEHP source contained detectable DEHP. Thus, the Florisil was very efficient for trapping this compound from air. Similarly, columns spiked with DDT and PCBs were shown to retain virtually all of the added sample on the first column, even after 5 days of air flow at 2-3 l/min. Test samples were then taken from various areas of the building showing a 35-90 ng/m^3 of PCB and 30-70 ng/m^3 of DEHP with the highest values found near the heating vents and in the hoods. It is apparent that this method may be used for monitoring air in industrial plants or other working areas and that its scope may be expanded. An important feature of this method is the very low blanks obtained (1 ng or less).

76-0542. Zehner, J. M.; Simonaitis, R. A. (Stored-Prod. Insect Res. Devel. Lab., ARS, USDA, Savannah, GA

31403). **Elimination of some integration errors in pesticide residue analyses.** *Anal. Chem.* 47(14): 2495-2496; 1975. (1 reference)

When an organophosphorus pesticide sample is injected for analysis into a gas chromatography system with a Tracor flame photometric detector in the phosphorus mode, the detector response passes through a minimum after the solvent elutes, and then gradually rises to base line without passing through a maximum. Because the response does not pass through maximum before the organophosphate peak elutes the integrator continues integrating until the pesticide peak (malathion) is eluted. Thus the integrator records an erroneous area as the entire signal is included from the time of the minimum to the time after the pesticide peak has eluted. This difficulty can be overcome by adding a low-boiling organophosphate such as tributyl phosphate in sufficient amount to the solvent to achieve 20 ppm during the extraction procedure. The tributyl phosphate causes the detector response to pass through a maximum after the minimum caused by the solvent and return to the base line before the pesticide peak elutes. This allows an accurate area for the pesticide to be recorded. The determination of malathion residues on rice would be a typical illustration of the use of this technique.

76-0543. Mestres, R.; Tourte, J.; Campo, M.; Illes, S. (Laboratoire Chimie Appl. Expertise, Fac. Pharmacie, Montpellier, France). **Residus de pesticides XXV bis. Methode polyvalente de recherche et de dosage des residus de pesticides divers dans les matieres alimentaires. [Pesticide residues. Part 25b. Universal method for the detection and determination of pesticide residues in foods.]** *Ann. Fals. Exp. Chim.* 68(726): 81-84; 1975. (1 reference) (French)

Modifications of a universal method developed and presented recently for the detection and determination of pesticide residues in food are described. Raw extract for rapid determination is prepared by diluting the vacuum evaporation residue of the ethyl acetate-dichloromethane extract with sulfur ether. For normal determination, the residue is combined with acetonitrile saturated with petroleum ether. Secondary extraction is done with dichloromethane, and determination is carried out by chromatographic method using florisil.

76-0544. Pitet, G.; De Sangosse, A. M.; Mariotti, J. A. (Chaire de Chimie Analytique, Faculte de Pharmacie, Toulouse, France). **Le dosage du "meta" polymere de l'acetaldehyde dans les pesticides. [Determination of acetaldehyde "meta" polymer in pesticides.]** *Ann. Fals. Exp. Chim.* 68(731-732): 339-344; 1975. (French)

A routine method is described for the determination of metaldehyde in technical pesticidal preparations. The sample to be analyzed is wetted with phosphoric acid and depolymerized with potassium dichromate in sulfuric acid. Potassium iodide is added, and the stoichiometric quantity of iodine liberated is determined by titration with sodium thiosulfate solution. The method has an error of 5-10%.

76-0545. Faugere, J. G.; Debruyne, H.; Coursier, H. (Laboratoire Municipal de Bordeaux, Bordeaux, France). **Le controle au laboratoire des aliments des animaux. [Laboratory control of animal feeds.]** *Ann. Fals. Exp. Chim.* 68(731-732): 345-365; 1975. (14 references) (French)

General guidelines are presented for the determination of additives, contaminants, and pesticide residues in animal feeds. Mercury residues are determined by atomic absorption spectrometry at 253.7 nm after mineralization with sulfonitrile, oxidation with potassium permanganate, and reduction to metallic mercury by means of tin chloride. Arsenic is determined, after mineralization with sulfuric acid and perhydrol, in the form of arsenic hydride on mercuric chloride-impregnated paper. Organochlorine pesticide residues are determined by gas chromatography with electron-capture detector after extraction with petroleum ether and cleanup on a floridine-filled column. For the determination of organophosphorus pesticides, extraction is done with a mixture of ethyl acetate and dichloromethane, after which the sample is injected into a chromatographic column, using a double flame ionization detector for sulfur and phosphorus. This method is used for the determination of 24 organophosphorus pesticides.

76-0546. Horiba, M.; Kitahara, H.; Kobayashi, A.; Murano, A. (Inst. Biol. Sci., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **[Gas-chromatographic determination of pyrethroid insecticides in aerosol formulations.]** *Bochu-Kagaku (Sci. Pest. Contr.)* 40(4): 123-132; 1975. (23 references) (Japanese)

A method for quantitatively determining pyrethroid compounds, coexisting insecticide components, and synergists in aerosol formulations by chromatography was devised. The greater part of the active ingredients could be separated by a column (1 m in length and 3 mm in i.d.) with 2% DEGS as the liquid phase. In this way phthalthrin, resmethrin, allethrin, pyrethrin, piperonyl butoxide, and other active ingredients could be determined. Because of the difficulty of separating resmethrin and piperonyl butoxide on a DEGS column, when the two components were present together they were separated with another column of 2% XE-60 (5 m in length and 3 mm i.d.) and determined separately. Using the present method 79 aerosols marketed in Japan were successfully analyzed.

76-0547. Anastasov, A.; Zhelev, N.; Marudov, G.; Rusev, P. (Scientific Center for Tobacco Research, Plovdiv, Bulgaria). **Utochnyavane na nay-podkhodyasht metod za opredelyane na ostatuchini kolichestva ot organokhlorini**

pestitsidi v tyutyuna s pomoshtta na gazovata khromatografia. [Refinement of the most suitable method for determining residual amounts of chloroorganic pesticides in tobacco by gas chromatography.] *Bulg. Tyutyun.* 18(12): 12-15; 1973. (5 references) (Bulgarian)

Four different methods for the extraction of organochlorine pesticide residues from tobacco for gas-chromatographic analysis are evaluated and compared. According to method 1, extraction is done with acetonitrile, and clean-up is done on florisil; method 2 uses *n*-hexane for extraction and silica gel for cleanup. In method 3, developed by R. F. Skrentny H. W. Dorough, extraction is done with a 9:1 ratio mixture of chloroform and methanol, and florisil is used for cleanup. The use of the Schmid-Rastetter method requires a 2:8 ratio mixture of methylene chloride and petroleum ether for extraction and florisil for cleanup. The comparative assessment of the extraction rates revealed methods 1 and 3 to be the best. In view of the availability of analytical chemicals in Bulgaria, method 3 is regarded as most suitable. Here, florisil can be replaced by silica gel without any change in the accuracy of the quantitative determination.

76-0548. Nagasawa, K.; Honda, H.; Ogama, A. (Sch. Pharm. Sci., Kitasato Univ., Tokyo, Japan). **Reductive cleavage of sulfur-containing carbamates with Raney nickel.** *Chem. Pharm. Bull.* 23(10): 2454-2458; 1975. (8 references)

The reductive cleavage of sulfur-containing carbamates with Raney nickel was studied in order to assess the applicability of Raney nickel for analysis of organophosphorus pesticides. Three types of sulfur-containing carbamates were studied including thiocarbamate, thiolocarbamate, and dithiocarbamate. Reductive cleavage of thiocarbamate with Raney nickel yielded *N,N*-diethylformamide, toluene, and hydrogen chloride; of thiolocarbamate yielded *N,N*-diethylmethylamine and toluene; and of dithiocarbamate yielded *N*-ethyl cyclohexylamine, *N*-methyl- *N*-ethyl cyclohexylamine, and *N,N*-diethyl cyclohexylamine. The results of this study suggest an effective participation of ethanol in the process of the reduction of the carbamates. Since most of the products were more or less adsorbed on Raney nickel, causing an unsatisfactory recovery, the application of this reaction for quantitative determinations would appear difficult.

76-0549. Fung, K. K. H. (Dep. Agric., Div. Agric. Chem., Melbourne, Victoria 3002, Australia). **Determination and identification of *S*-methyl *N*-[(methylcarbamoyl)oxy] thioacetimidate (methomyl) residues in tobacco.** *J. Agric. Food Chem.* 23(4): 695-698; 1975. (3 references)

A method for the determination of methomyl (*S*-methyl *N*-[(methylcarbamoyl)oxy] thioacetimidate) in tobacco is described. After ethyl acetate extraction of methomyl from the tobacco and cleanup by solvent partitioning, the pesticide was converted to its volatile oxime derivative (methyl *N*-hydroxylthio acetimidate) by alkaline hydrolysis. Subsequent gas chromatographic determination of the oxime derivative was carried out in a gas—liquid chromatograph (GLC) equipped with a flame photometric detector (FPD) and a 394-nm sulfur filter. The method was used to analyze both green and cured tobacco with a sensitivity of about 0.01 ppm based on a 50-g sample. The average recovery for both forms of tobacco was 87%. Methomyl residues analyzed in the GLC were confirmed by gas chromatography—mass spectrometry (GC-MS), and further identification was provided by thin-layer chromatography (TLC). (Author abstract by permission)

76-0550. Cochrane, W. P.; Parlar, H.; Gaeb, S.; Korte, F. (Analyt. Services Sect., Plant Products Div., Canada Dep. Agric., Ottawa, Ontario, Canada). **Structural elucidation of the chlordene isomer constituents of technical chlordane.** *J. Agric. Food Chem.* 23(5): 882-886; 1975. (17 references)

The technical chlordane constitutents designated α-, β-, and γ-chlordene are isomers of chlordene ($C_{10}H_6Cl_6$). These isomers are formed via the rearrangement of chlordene by the action of Cl_2 or free-radical initiating agents, and they no longer possess the cyclodiene-type structure. Elucidation of these isomeric structures involved various chemical derivatization reactions. Oxidation with chromic oxide yielded ketones and epoxides while reduction with Zn—HOAc or $CrCl_2$ produced mono- and didechlorinated homologs. Photoisomers, in which the two original ClC = CCl bonds had been cross-linked, resulted from their unsensitized UV irradiation. Spectral confirmation of structure was obtained by ^1H NMR and gas chromatography-mass spectrometry (GC-MS) studies. It is postulated that α-chlordene is 1,2,3,5,7,8- hexachloro- 1,3a,4,5,6,6a - hexahydro- 1,4-ethenopentalene (III) and β-chlordene is 2,3,3a,4,5,7-hexachloro- 3a,6,7,7a-tetrahydro- 1,6-methano- 1*H*- indene (XIII), with γ-chlordene (XI) being the 2,3,3a,4,5,8-hexachloro isomer of β-chlordene. (Author abstract by permission)

76-0551. Nelson, J. O.; Matsumura, F. (Dep. Entomology, Univ. Wisconsin, Madison, WI 53706). **Separation and comparative toxicity of toxaphene components.** *J. Agric. Food Chem.* 23(5): 984-990; 1975. (12 references)

Components and fractions to toxaphene have been separated by a combination of methods including Sephadex LH-20-methanol column chromatography, thin-layer chromatography, reverse phase thin-layer chromatography, and preparative gas chromatography. Fractions separated by the above methods show varying toxicities to three aquatic organisms, a blue-green alga, brine shrimp, and mosquito larvae. Employing a combination of preparation TLC and GC methods, a toxic fraction of toxaphene 1.87, 1.75, and 1.35 times more toxic than

toxaphene to mosquito larvae, brine shimp, and algae, respectively, has been isolated. The fraction, though it behaves as a single component in various chromatographic systems, was found to consist of two components on the basis of nuclear magnetic resonance (NMR) spectrscopy. They were partially characterized by infrared and mass spectrometry as octachlorobornanes. (Author abstract by permission)

76-0552. Villanueva, E. C.; Jennings, R. W.; Burse, V. W.; Kimbrough, R. D. (Cent. Disease Contr., U.S. Dep. HEW, Atlanta, GA 30333). **A comparison of analytical methods for chlorodibenzo-*p*-dioxins in pentachlorophenol.** *J. Agric. Food Chem.* 23(6): 1089-1091; 1975. (10 references)

The chlorodibenzo-*p*-dioxin (CDD) contamination of the same commercial pentachlorophenol (PCP) was determined by four methods described in the literature. The CDD levels were estimated by electron capture-gas chromatography (EC—GC). The presence of CDD, chlorodibenzofuran (CDF), and chlorodiphenyl ether (CDE) was confirmed by gas chromatography-mass spectrometry (GC-MS). Hydroxychlorodiphenyl ethers were also found. The results show wide variations as a function of the analytical methods. (Author abstract by permission)

76-0553. Lawrence, J. F.; Laver, G. W. (Food Res. Div., Bureau of Chem. Safety, Food Directorate, Natl. Health and Welfare, Tunney's Pasture, Ontario, Canada). **Analysis of some carbamate and urea herbicides in foods by gas-liquid chromatography after alkylation.** *J. Agric. Food Chem.* 23(6): 1106-1109; 1975. (16 references)

The quantitative analysis of a number of carbamate and urea herbicides in selected foods was examined. The compounds were extracted from the crops with ethanol which was subsequently partitioned between water and chloroform. The organic extract was evaporated to dryness and alkylated with sodium hydride-methyl iodide. The products were extracted with hexane and directly analyzed by gas chromatography. Detection of the derivatives was accomplished with a Coulson electrolytic conductivity detector in the nitrogen mode. No column cleanup was required for any of the samples down to the 0.01 ppm level. Detection limits were about 0.005 ppm. Recoveries were usually 60-100% depending upon the herbicide. Confirmation of the chlorine-containing herbicides was carried out with the Coulson in the chloride (reductive) mode. (Author abstract by permission)

76-0554. Bowes, G. W.; Mulvihill, M. J.; DeCamp, M. R.; Kende, A. S. (Calif. Water Resour. Contr. Board, Div. Plan. Res. Sacramento, CA 95801). **Gas chromatographic characteristics of authentic chlorinated dibenzofurans; Identification of two isomers in American and Japanese polychlorinated biphenyls.** *J. Agric. Food Chem.* 23(6): 1222-1223; 1975. (11 references)

Retention times of 15 authentic standards of chlorinated dibenzofurans containing from three to six chlorine atoms were determined relative to dieldrin on gas chromatograph columns of four different polarities (3% OV-1; 5% SP-2401; 1.5% OV-17/1.95% QF-1; and 3% OV-1/5% OV-210/6% OV-225). On the basis of coinjections of the standards with extracts from American (Aroclor) and Japanese (Kanechlor) polychlorinated biphenyls (PCB), two of the compounds in these extracts have been identified as 2,3,7,8-tetra- and 2,3,4,7,8-pentachlorodibenzofuran. The concentrations of the compounds were estimated to range from 0.08 to 0.83 μg/g of PCB. (Author abstract by permission)

76-0555. Bushway, R. J.; Cramer, C. .; Hanks, A. R.; Colvin, B. M. (Dep. Agric. Anal. Services, Texas A&M Univ, College Station, TX 77843). **High-performance liquid chromatographic determination of strychnine in grain baits.** *J. Assoc. Off. Chem.* 58(5): 957-960; 1975. (8 references)

A simple and rapid high-performance liquid chromatographic procedure is described for the determination of strychnine. Grain baits containing strychnine alkaloid are ground, mixed, and extracted by shaking with chloroform. Without further cleanup, extract filtrates are injected directly onto a liquid chromatograph. Chromatography is complete within 7 min and peak heights are used for quantitation. Separations were made on a 30 cm × 4 mm id stainless steel column packed with μ Porasil (8-12 μm silica). The eluting solvent was methanol-chloroform (10+90) at a flow rate of 2.0 ml/min. Recovery of spiked samples ranged from 91.5 to 95.2%. Confirmation of strychnine from a commercial sample was made by high resolution mass spectrometry with mass agreement to 1.2 ppm. (Author abstract by permission)

76-0556. Hanks, A. R.; Engdahl, B. S.; Colvin, B. M. (Dep. Agric. Anal. Services, Texas A&M Univ., College Station, TX 77843). **Gas-liquid chromatographic determination of strychnine in grain baits.** *J. Assoc. Off. Anal. Chem.* 58(5): 961-964; 1975. (10 references)

A simple and rapid gas-liquid chromatographic procedure, using a 6′ × 1/4″ glass column packed with 5% SE-30 on Chromosorb W (DMCS) and a flame ionization detector, is described. Grain baits containing strychnine alkaloid are ground, mixed, and extracted by shaking with chloroform containing an internal standard, 1,3,5-triphenylbenzene. Without further cleanup, extract filtrates are injected directly into a gas chromatograph. Peak height ratios are used for quantitation of strychnine. The analysis of commercial samples shows that the method compares well with a commonly employed ultraviolet spectrophotometric method; good precision, with recoveries ranging from 89.9 to 91.7%, is obtained in the analysis of prepared samples. The method is sensitive to 2 μg strychnine. (Author abstract by permission)

76-0557. Bushway, R. J.; Engdahl, B. S.; Colvin, B. M.; Hanks, A. R. (Dep. Agric. Anal. Serv., Texas A&M Univ., College Station, TX 77843). **Separation of rotenoids and the determination of rotenone in pesticide formulations by high performance liquid chromatography.** *J. Assoc. Off. Anal. Chem.* 58(5): 965-970; 1975. (15 references)

The rotenoids deguelin, B-dihydrorotenone, dehydrorotenone, rotenone, 6$\alpha\beta$,12$\alpha\beta$-rotenolone, and tephrosin were chromatographed on 8—12 μm silica. A mobile phase of chloroform-isooctane (35+65) pumped at a flow rate of 1 ml/min through a 30 cm column was used and the absorbance of the eluate was monitored at 294 nm. Rotenone, B-dihydrorotenone, deguelin, and dehydrorotenone are completely resolved while 6$\alpha\beta$,12$\alpha\beta$-rotenolone and tephrosin chromatograph as one peak. This method has potential as a preparative separation technique for rotenoids. Also described is a procedure to quantitatively measure rotenone in pesticide formulations. Samples were extracted with chloroform and chromatographed at a flow of 2.5 ml/min. The method is rapid (rotenone is eluted in 12 min) and reproducible. (Author abstract by permission)

76-0558. Miller, V. L.; Gould, C. J.; Csonka, E. (Dep. Agric. Chem., Western Washington Res. and Extension Center, Washington State Univ., Puyallup, WA 98371). **Measurement of thiabendazole, benomyl, and folcidin fungicides in aqueous suspensions.** *J. Assoc. Off. Anal. Chem.* 58(5): 971-973; 1975. (2 references)

An improved procedure is described for the estimation of benomyl (methyl 1-(butylcarbamoyl)-2-benzimidazole carbamate), folcidin (methyl [1-([(5-canopentyl) amino] carbonyl- 1*H*- benzimidazole-2-yl] carbamate), and thiabendazole (2-(4′-thiazolyl)- benzimidazole) in the concentration range of 0.1-1.0 mg/ml. Representative samples of the fungicides in aqueous suspension are shaken with a chloroform solution of cupric acetate and 1-dimethyl- amino-2- propanol (sodium hydroxide is added in the case of thiabendazole) to produce a green color in the chloroform phase. The analysis may be completed by spectrophotometric measurement or by comparison with described artificial standards. (Author abstract by permission)

76-0559. Page, B. D.; Kennedy, B. P. C. (Food Res. Div., Food Dir., Health Protect. Br., Health and Welfare Canada, Ottawa, Ontario, Canada). **Determination of methylene chloride, ethylene dichloride, and trichloroethylene as solvent residues in spice oleoresins, using vacuum distillation and electron capture-gas chromatography.** *J. Assoc. Off. Anal. Chem.* 58(5): 1062-1068; 1975. (18 references)

A quantitative gas chromatographic (GC) method is described for the determination of residual methylene chloride, ethylene dichloride, and trichloroethylene in spice oleoresins. The proposed method involves vacuum distillation in a closed system with toluene as a carrier solvent. Quantitation by electron capture GC on Porapak Q is facilitated by water extraction and by the addition of *trans*-1,2- dichloroethylene as an internal standard. Recoveries from oleoresins spiked at 30, 15, and 6 ppm ranged from 93 to 102%. To assess the possibility of interference from spice volatiles, the procedure was applied to 17 different spice oleoresins from 3 different manufacturers. No interferences were found, but methylene chloride levels up to 83 ppm and ethylene dichloride levels up to 23 ppm were detected. Trichloroethylene was not detected in any of the oleoresins. (Author abstract by permission)

76-0560. Carlstrom, A. A. (Chevron Chem. Co., Richmond, CA 94804). **Gas-liquid chromatographic determination of naled in pesticide formulations.** *J. Assoc. Off. Anal. Chem.* 58(6): 1162-1168; 1975. (41 references)

Dusts, emulsions, concentrates, and technical material covering a wide range (1-92%) of naled were diluted or extracted with chloroform. Dibutyl phthalate was added to sample extracts as an internal standard before gas-liquid chromatographic (GLC) injection. Twelve column packings covering the entire polarity scale were tested, and 3% XE-30 was chosen, based on the best resolution for a difficult-to-separate low volume concentrate. Response is linear from 1 to 50 mg naled/ml and the coefficient of variation for the GLC step is 0.81%. Of 29 other active ingredients which have been formulated with naled, diazinon and 1 isomer of BHC elute with naled, while dicrotophos elutes with the internal standard. (Author abstract by permission)

76-0561. Yang, R. S. H.; Coulston, R.; Golberg, L. (Inst. Compar. Human Toxicol., Albany Med. Coll., Albany, NY 12208). **Chromatographic methods for the analysis of hexachlorobenzene and possible metabolites in monkey fecal samples.** *J. Assoc. Off. Anal. Chem.* 58(6): 1197-1201; 1975. (10 references)

The separation and identification of hexachlorobenzene (HCB), pentachlorobenzene (QCB), and pentachlorophenol (PCP) in thin layer, high-pressure liquid, and gas chromatography are reported. Satisfactory results were obtained with reverse phase thin layer and high-pressure liquid chromatography. The 2 gas chromatographic columns tested gave adequate separation of HCB and QCB. A PCP methylation process using dimethyl sulfate was attempted. Procedures are presented for extraction, cleanup, separation, and identification of HCB and possible metabolites from feces of a rhesus monkey treated with ^{14}C-HCB. Recovery of radioactivity in excess of 96% was attained in extracts from feces by these methods. Preliminary evidence suggests the formation of PCP and possibly other polar metabolites from HCB in the rhesus monkey. (Author abstract by permission)

76-0562. Rangaswamy, J. R.; Vijayashankar, Y. N. (Discipl. Infest. Contr. Pestic., Cent. Food Technol. Res.

Inst., Mysore-570013, India). **A rapid method for the determination of manganese ethylenebisdithiocarbamate and its residues on grains.** *J. Assoc. Off. Anal. Chem.* 58(6): 1232-1234; 1975. (8 references)

A method has been developed, based on the periodate oxidation of the manganese in the coordination product of zinc ion and manganese ethylene bisdithiocarbamate to permanganic acid, to determine Dithane M-45. The relationship between the intensity of color and the concentration of manganese obeys Beer's law up to 100 μg at 540 nm. The method can be easily applied to the determination of the active ingredient in formulations and also for residue analysis. The method is sensitive to 6 μg and can be used to determine 6 μg fungicide at the 20 g sample level. (Author abstract by permission)

76-0563. Ihnat, M.; Thompson, B. (Chem. Biol. Res. Inst., Agric. Can., Ottawa, Ontario, Canada, K1A OC6). **Collaborative study of a spectrophotometric method for determining maleic hydrazide residues in tobacco and vegetables.** *J. Assoc. Off. Anal. Chem.* 58(6): 1235-1243; 1975. (8 references)

A distillation-spectrophotometric method for the determination of maleic hydrazide residues in tobacco and vegetables reported previously was studied collaboratively. Ten laboratories submitted analytical results on 10 samples containing residues resulting either from field treatment or laboratory fortification. The samples were estimated to contain from 0.99 to 16.36 μg maleic hydrazide/0.5 g sample analyzed. The coefficients of variation based on precision standard deviation ranged from 57.7% for the lowest residue content to 32.4% for the highest. The corresponding coefficients of variation based on overall standard deviations were estimated to be at least one-fifth larger. Strong evidence of systematic laboratory differences was found (*F*-test, significant at 0.1%). Apparent recoveries of 10.0 μg maleic hydrazide added to 0.5 g flue cured tobacco and potato were 97.3 and 89.7%, respectively. Apparent recoveries of 16.0 and 16.5 μg added to 0.5 g green bean were 87.4 and 85.5%, respectively. The precision of the method studied was no better than that of the current official final action method, 29.121-29.127, and its adoption is not recommended. (Author abstract by permission)

76-0564. Aoki, Y.; Takeda, M.; Uchiyama, M. (Food Res. Cent., Japan Med. Foods Assoc., Tokyo, Japan). **Comparative study of methods for the extraction of eleven organophosphorus pesticide residues in rice.** *J. Assoc. Off. Anal. Chem.* 58(6): 1286-1293; 1975. (12 references)

Several extraction methods are compared for the simultaneous analysis of organophosphorus pesticides in unpolished rice. Four stationary phases were used for the subsequent gas-liquid chromatographic (GLC) determination of the selected pesticides. Using 3 different GLC columns, 11 pesticides were completely separated and identified. The efficiency of the cleanup and the sensitivity of the analytical method were evaluated by using powdered unpolished rice samples fortified with the pesticides and also wheat and dried bean samples. Average recoveries ranged from 74.7% for disulfoton to 97.4% for malathion in unpolished rice and from 68.1% for disulfoton to 108.3% for malathion in other crops. The method described is applicable to the analysis of selected organophosphorus pesticide residues in unpolished rice, wheat, buckwheat, and dried beans. (Author abstract by permission)

76-0565. Chau, A. S. Y.; Terry, K. (Water Qual. Br., Canada Cent. Inland Waters, Burlington, Ontario, Canada). **Analysis of pesticides by chemical derivatization. I. A new procedure for the formation of 2-chloroethyl esters of ten herbicidal acids.** *J. Assoc. Off. Anal. Chem.* 58(6): 1294-1301; 1975. (22 references)

A new esterification procedure was developed to form 2-chloroethyl esters for 10 common herbicidal acids, using dicyclohexyl carbodiimide and 2-chloroethanol. This reagent was found to be more desirable than the commonly used boron trichloride/2-chloroethanol reagent. Maximum esterification was given for picloram at a low reaction temperature with a shorter reaction time. Also, maximum esterification of dicamba and 2,3,6-TBA was achieved. The boron trichloride/2-chlorethanol gave poor or little esterification with these 2 acids under the various conditions investigated. The effects of solvents on esterification with the 2 reagents were also explored. (Author abstract by permission)

76-0566. Sieber, J. N.; Landrum, P. F.; Madden, S. C.; Nugent, K. D.; Winterlin, W. L. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Isolation and gas chromatographic characterization of some toxaphene components.** *J. Chromatogr.* 114(2): 361-368; 1975. (11 references)

Column chromatography of technical toxaphene on activated alumina reproducibly yields eight major fractions from which 2,2,5- *endo*,6-*exo*,8,9,10- heptachlorobornane and 2,5,6- *exo*,8,9,10- heptachlorodihydro camphene may be readily isolated by preparative gas-liquid chromatography. These and some other reported toxaphene components were characterized by gas-liquid chromatographic retentions relative to aldrin on packed columns of OV-101, OV-17, and QF-1, and on a capillary open-tubular column of OV-101. Structural assignments were revised for some components on the basis of retentions. The fractionation and isolation procedure may have general utility for separating toxaphene components, and the retention data form a convenient basis for component comparison. (Author abstract by permission)

76-0567. Pryde, A.; Darby, F. J. (Wolfson Liquid Chromatogr. Unit, Dep. Chem., Univ. Edinburgh, Edinburgh, Scotland). **The analysis of paraquat in urine by**

high-speed liquid chromatography. *J. Chromatogr.* 115(1): 107-116; 1975. (20 references)

The paraquat content of urine can be directly determined by high-speed liquid chromatography using ultraviolet spectrophotometric detection. The method separates paraquat (and diquat) from the ultraviolet-absorbing components of urine and no extraction or pre-treatment of the sample is required prior to analysis. Concentrations down to 100 μg/l of paraquat in urine were determined. Quantitative results are in good agreement with those obtained by a colorimetric method. Diquat does not interfere with the analysis

76-0568. Mukherjee, G.; Mukherjee, A. K.; Chakraborti, J.; Roy, B. R. (Cent. Food Lab., Calcutta, India). **A comparative study on the efficiency of different adsorbent columns for the clean-up of pesticide residue extracts.** *J. Food Sci. Technol. (Mysore)* 11(4): 175-176; 1974. (15 references)

The efficiencies of columns of alumina, silica gel, silica gel/celite, magnesium trisilicate, magnesium hydroxide, and charcoal for the cleanup of pesticide residue extracts were compared. Columns 14 in. in diameter were filled with 2 g of adsorbent, and 5 ml of an extracted solution containing known amounts of pesticides was applied to each. *n*-Hexane was used as the mobile solvent for the chlorinated pesticides, and acetic acid was used for the organophosphorus pesticides. The extract from each column was applied to a thin-layer plate of silica gel and either 2% diphenylamine in acetone (chlorinated pesticides) or 0.5% palladium chloride in 8% HCl was used as the chromogenic agent. Silica gel and silica gel/celite were unsatisfactory due to the presence of both fat and pigments in the eluate. Although magnesium trisilicate offered satisfactory pesticide recovery, the elution speed was too slow, and unautoclaved magnesium hydroxide gave poor recoveries of DDT and malathion in the presence of pigments. Activated and inactivated alumina gave complete removal or fat and partial removal of pigments plus 100% recovery of chlorinated pesticides, but recovery of malathion was poor. Activated charcoal provided the most efficient removal of pigments and fats and yielded 100% recoveries of both chlorinated and organophosphorus pesticides with an eluate of 1:1 petroleum ether and ethyl ether.

76-0569. Mehrotra, R. K.; Katrola, S. P.; Ramanufam, S. (Defense Res. Develop. Establishment, Gwalior, India). **A note on new chromogenic TLC spray reagents for the detection of some organochlorine pesticides.** *J. Food Sci. Technol. (Mysore)* 11(4): 197-199; 1974. (6 references)

A number of chromogenic reagents were screened for the qualitative detection of organochlorine insecticides in service rations. Thin-layer chromatographic plates coated with silica gel were spotted with aldrin, dieldrin, endrin, γ-BHC, *p,p'*-DDT, heptachlor, endosulfan (α or β), and/or methoxychlor. Ascending TLC was carried out using cyclohexane-chloroform (80:23) or petroleum ether-carbon tetrachloride (50:50). The plates were then sprayed with Morin reagent in ethanol or bromophenol blue in acetone mixed with aqueous silver nitrate solution. On spraying with the silver nitrate-bromophenol blue reagent, the organochlorine pesticides were distinguishable on the basis of the Rf values and by the resulting green spots of varying intensity. These pesticides could also be distinguished after Morin reagent application under UV light. There was a progressive increase in spot area with increasing pesticides concentration; a parabolic relationship between log wt. and area; a linear relationshilp between log wt. and square root of area. Thus the two chromogenic agents offer potential for the semiquantitative estimation of pesticides.

76-0570. Lakshminarayana, V.; Menon, P. K. (Central Plant Protection Training Inst., Hyderabad, India). **Clean-up of cereal and milk for determination of residues of organochlorine insecticides.** *J. Food Sci. Technol. (Mysore)* 12(3): 144-146; 1975. (12 references)

A simple clean-up method for cereal and milk samples has been devised which uses a 500 micron thick basic alumina TLC plate and is suitable for the subsequent determination of organochlorine insecticide residues. Acetonitrile is used as the developing agent. Experiments which were performed showed that the method is very efficient for cleaning up extracts containing lipids prior to residue determination by TLC. By using this clean-up method, 0.1 μg of insecticide can be detected in 5 g of the cereal and milk, thus giving the method the same sensitivity as gas-liquid chromatography with electron capture detector, without the need for sophisticated equipment and costly clean-up procedures. The method can be followed with a minimum period of training and should prove beneficial to labs monitoring insecticide residues in these vital food items.

76-0571. Chakraborti, J.; Mukherjee, G.; Mukherjee, A. K.; Roy, B. R. (Central Food Lab., Calcutta-16, India). **Estimation of dimethoate in foods.** *J. Food Sci. Technol. (Mysore)* 12(3): 146-148; 1975. (15 references)

This paper reports a rapid and simple method for the qualitative detection and quantitative estimation of the amount of dimethoate pesticide residue on foodstuffs. The method employs solvent extraction, thin-layer chromatography, and colorimetry. The yellow spots of the concentrated benzene extract, obtained on the TLC plate after spraying with palladium chloride, are scraped into a test tube. The substance is eluted with *N,N*-dimethyl formamide and the absorbance of the clear solution is measured spectrophotometrically at the wavelength of 435 nm.

76-0572. Lynch, D. (Author address not given). **Evaluation of slow-release insecticides.** *Mfg. Chem. Aerosol News* 45(6): 39-40; 1974.

An apparatus has been designed to effectively measure the rate of emission of dichlorvos from slow-release products. The apparatus consists of three parts: a temperature control box containing a preheater which heats the air flow to 25°C; a test sample container which, while being large enough to accommodate samples of various sizes, must yet permit a smooth positive air flow at extremely low velocity without increasing the evaporation rate of dichlorvos; and an extraction apparatus consisting of two 250 ml Dreschel bottles containing water and fitted with domed sintered glass caps of porosity 1. The sample is placed in the sample container and the air flow for an initial bypass period is adjusted to 9.5 l/min and allowed to purge the system for about 5 min. After purging, the stopcocks on the Dreschel bottles are placed in the extract position for 120 sec and then returned by bypass. Various methods may be used to analyze the contents of the Dreschel bottles, but sensitivity as low as 20 μg/l is necessary. The cholinesterase inhibition of human blood plasma is recommended as it is not only relatively simple, but allows up to 75 samples to be analyzed per day.

76-0573. Zietek, M. (Inst. Toxikol. Forens. Chem., Cracow, Poland). **Ueber die polarographische Bestimmung von Parathion und seinem Metabolit *p*-Nitrophenol in Blutextrakten. [On the polarographic determination of parathion and its metabolite *p*-nitrophenol in blood extracts.]** *Mikrochim. Acta* 2(4-5): 463-470; 1975. (19 references) (German)

A simplified polarographic method is proposed for the determination of parathion and its metabolite, *p*-nitrophenol, in blood. After extraction with 1% isoamyl alcohol in a 4:1 ratio mixture of petroleum ether and ether, *p*-nitrophenol is isolated from the extract by reextraction with an ammoniacal solution. The organic phase containing parathion is evaporated, and the dry residue is dissolved in the electrolyte (0.4 *M* acetic acid, 0.2 *N* potassium chloride, and 5% gelatin in acetone). The ammoniacal phase containing *p*-nitrophenol is combined with 50% acetic acid and 0.2 *N* potassium chloride for polarographic determination in the potential range of -0.4 to -1.4 volts. The recovery rate is 93.1-94.5% for parathion and 95.1-96.2% for *p*-nitrophenol. This method can be used satisfactorily in the range of 20-100 μg/ml for *p*-nitrophenol and in the range of 40-100 μg/ml for parathion.

76-0574. Goodman, A.; Martens, H. (Edgewood Arsenal, Aberdeen Proving Grounds, MD 21010). **Studies on the use of electric eel acetylcholinesterase for anticholinesterase agent detection.** *Natl. Tech. Inform. Serv.*, AD-A007 101, 1975, 15 p. (10 references)

The threshold sensitivity for detection of GB and VX with cholinesterase from electric eel and horse serum is reported. Eel enzyme has ten times the sensitivity of horse enzyme for both agents making it an attractive choice for future kit development. The effect of various buffers, support matrices, and storage conditions on wettability and colorimetric substrate response of eel enzyme tickets was also studied and compared with that of horse serum enzyme tickets. The most wettable and responsive eel enzyme tickets were those prepared from various zwitterionic buffers with fiber paper. The use of filter paper and phosphate buffer gave tickets which were difficult to wet and/or which had poor substrate response after extended or accelerated storage. (Author abstract by permission)

76-0575. Ueda, K.; Kawai, M. (Showa Med. Coll., Tokyo, Japan). **[Comparison and evaluation of methods for determination of cholinesterase activity.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 442-443; 1975. (Japanese)

Two methods of determining serum cholinesterase activity, the ATCh/DTNB method and the improved delta pH method, were compared. The correlation between the two methods was assessed by examination of 0.01 ml of separated serum from 175 hospitalized patients. The former method is based on colorimetry of the 2-nitro-5-thiobenzoic ion formed by the reaction between 5,5′-dithiobis-2- nitrobenzoic acid and thiocholine, released from thiocholine ester. The relatively short reaction time without non-enzymatic decomposition; the ability to represent ChE in μmole/g/min or μmole/ml/min; the ability to determine both specific and non-specific ChE; and the correlation coefficient of the ChE values determined, 0.749, make the former method very useful in actual use from the viewpoints of sensitivity, rapidity and simplicity. The only difficulty was the coincidence of the absorption maximum of the yellow 2-nitro-5-thiobenzoic ion with that of hemoglobin.

76-0576. Kurosawa, K.; Asanuma, N.; Suzuki, A.; Miyairi, K.; Abe, E.; Sasaki, K. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). **[Comparison of methods for determination of cholinesterase activity by delta pH and by colorimetry.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 444-445; 1975. (Japanese)

Two methods for determination of cholinesterase activity (ChE) were compared on groups of 400 persons divided into age groups of 20, 30, 40, 50 and 60 years. One method tested was the conventional delta-pH method, and the other one was based on colorimetry using 5,5′-dithiobis-2- nitrobenzoic acid (DTNB). The results of determination of ChE values in whole blood and serum obtained by two methods were compared. The value in whole blood was higher than that in serum by the colorimetric method, probably due to the specificity for true ChE in the erythrocytes. The value in serum was higher than that in whole blood by the Δ-pH method. The colorimetric method had many advantages such as high sensitivity, possibility for use in microanalysis, and insensitivity to temperature. No relationship was noted between the values of ChE obtained by the colorimetry method and diseases such as hypertension, nephrosis, diabetes mellitus, cirrhosis, and anemia. The colorimetric method should be

suitable for tracing the ChE of small animals without killing them.

76-0577. Sasaki, S.; Sugaya, H.; Kagaya, S.; Watanabe, K.; Miura, O. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan). [**Determination of paraquat dichloride in human tissues.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(3): 456-457; 1975. (Japanese)

Subsequent to autopsies on two women who committed suicide by swallowing paraquat dichloride, the levels of this herbicide in human organs were determined. The method consists of homogenizing the specimen with addition of trichloroacetic acid and centrifuging the homogenate at 1500 *g* for 15 min. The supernatant is chromatographed on a column of Dowex AG 50W x 8 (100-200 mesh). The speciment was elevated with a saturated aqueous solution of ammonium chloride, alkaline sodium hydrosulfite solution was added to the first eluate, and then colorimetry was performed. The values found in the tissues of the 23.65, 6.84, 3.70, 0.42 and 0.59 μg/g of kidney, liver, thyroid gland, subcutaneous fat, and omental fat. No paraquat dichloride was detected in any tissue or organ of cadavers without any history of paraquat dichloride c. ntact.

76-0578. Wakimoto, T.; Fukushima, M.; Tatsukawa, R.; Ogawa, T. (Sch. Environ. Protection, Fac. Agric., Ehime Univ., Matsuyama, Ehime, Japan). [**Separation of PCBs from *p,p*-DDE and other organochlorine insecticides on freshly prepared silica gel.**] *Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 49(10): 499-503; 1975. (2 references) (Japanese)

A method of preparing silica gel was examined. It consisted of completely neutralizing water glass with hydrochloric acid, then washing and drying the product. The silicagel thus prepared permitted the separation of *p,p'*-DDE and polychlorinated biphenyls with small numbers of chlorine atoms. The analytical recovery was 89-98% of the pesticide components. The silica gel thus prepared showed no coagulated masses under electron microscopy and was finer than several commercial silica gels. The results of differential thermal analysis of the silica gel showed a very large endothermic curve, indicating a large absorbing capacity.

76-0579. Orth, R. A.; Minett, W. (Dep. Agric., Melbourne, Victoria, Australia 3002). **Iodometric analysis and shelf life of malathion in formulations.** *Pestic. Sci.* 6(3): 217-221; 1975. (10 references)

Using an iodometric method for the determination of malathion in emulsifiable concentrates, values of active ingredient in four commercial formulations and one primary reference standard were within ±0.7% weight/volume (w/v) of the stated concentrations. A standard deviation of 0.42% w/v and 95% confidence limits of ±0.9% w/v for a single determination were calculated for the method. Added moisture and elevated temperature were found to accelerate malathion breakdown in the commercial formulations. The greatest breakdown rate of 5.2% w/v per 100 days occurred with a formulation stored at 27%C containing 0.5% v/v added moisture. (Author abstract by permission)

76-0580. Self, C.; McKerrell, E. H.; Webber, T. J. N. (Shell Res. Ltd., Kent, ME9 8AG, England). **Liquid chromatography and its application to pesticide analysis.** *Proc. Anal. Div. Chem. Soc.* 12(11): 288-291; 1975. (3 references)

The applicability of liquid chromatography to the analysis of technical and formulated products has been studied over a three year period. At first totally porous adsorbents were used, but the columns were inefficient owing to slow mass transfer and channelling effects. Porous-layer bend packings gave better efficiencies but it was difficult to obtain reproducible performance. Porous microparticulate silicas and aluminas having diameters of 5 or 10 μm permitted reproducible high performance columns to be prepared with typical HETP values of 0.02-0.03 mm. The selectivity can be improved further by using bonded-phase packings in which an organic group is chemically bonded to the silica adsorbent via the stable siloxane linkage. Procedures for chemically bonding liquid phase to micro-particulate silica are being examined. Preliminary preparations of a bonded-phase material having 3-aminopropyl groups bonded to the surface of 5-μm silica have given reproducible, efficient columns exhibiting a different selectivity from that of silica packings. It is noted that the improved column performance obtained with microparticulate materials is only observed when efficient liquid chromatography systems are employed. Liquid chromatography performed with a good system compares very favorably with packed-column gas chromatography in terms of speed, efficiency, and resolution.

76-0581. McBlain, W. A.; Wolfe, F. H. (Dep. Zool., Univ. Alberta, Edmonton, Alberta, Canada). **Resolution of the optical isomers of *o,p'*-DDT.** *Tetrahedron Lett.* 49: 4351-4352; 1975. (8 references)

The preliminary results are presented of the first resolution of *o,p'*-DDT. Racemic *o,p'*-DDT was nitrated with fuming nitric acid in acetic anhydride with carbon tetrachloride as cosolvent and sulfuric acid as catalyst, yielding 5 compounds, of which a mononitrated derivative predominated. This mononitrated compound was reduced to the corresponding monoamine and converted to its *d*-10-camphorsulfonate salt. The salt yielded a levo amine. Although refluxing racemic or levo-enriched salts in acetonitrile had led to purification of the levo amine, refluxing of dextro-enriched salts unexpectedly led to purification of the dextro amine. The combined salts recovered from the mother liquors of the above refluxes were further refluxed 6 times and the resultant salt yielded the dextro

amine. Deamination via diazonium salts gave the *o,p'*-DDT enantiomers, both of which had melting points and NMR and GLC data typical of (±)*o,p'*-DDT. It is suggested that this technique may prove useful for the resolution of the medically important *o,p'*-DDD.

76-0582. Yumoto, K. (Dep. Prevent. Med. Pub. Health, Tokyo Med. Coll., Tokyo, Japan). [**Experimental studies on the effects of bis-tri-*n*-butyl-tin oxide on some enzymes and lipids in rabbits.**] *Tokyo Ika Daigaku Zasshi (J. Tokyo Med. Coll.)* 33(2): 157-176; 1975. (70 references) (Japanese)

Certain organotin compounds have been used increasingly in various areas of agriculture and industry in recent years, especially as antifungal agents. The effects of tributyltin oxide on enzyme and lipid levels in rabbit serum were examined by peroral administration at the rate of 12, 7, 4, or 2.5 mg/kg/day, six days a week, for six weeks. Eight rabbits were used at each dose level. In the presence of severe poisoning symptoms the GOT, GPT, and LDH are increased, while LAP and AlP remain at their initial levels. The triglyceride, phospholipid, and β-lipoprotein levels increased, and the total and free cholesterols increased slightly. Free fatty acid levels remained practically constant. The symptoms developed dissipate within a few weeks after administration of the substance is discontinued.

76-0583. Wakashin, K. (Dep. Pathol., Tokyo Med. Coll., Tokyo, Japan). [**Experimental studies on the toxicity of organic tin compounds. Morphology of butyltin intoxication.**] *Tokyo Ika Daigaku Zasshi (J. Tokyo Med. Coll.)* 33(4): 573-596; 1975. (50 references) (Japanese)

Morphological studies were performed following acute and chronic poisoning with dibutyltin chloride and tributyltin chloride. After intraperitoneal injection to young adult male rats, the respective median lethal doses were 5.012 mg/kg for dibutyltin dichloride and 2.239 mg/kg for tributyltin chloride. Major histological findings in animals that died early were generalized circulatory disturbances including extensive pulmonary hemorrhage and central nervous system edema. The liver, kidney, and spleen were the organs demonstrating most extensive morphological alterations after a single LD50 dose. Ultrastructural changes were seen in the capillary walls of liver and kidney, including glomeruli, and in the liver parenchymal cells (disorganization and vacuolation of the endoplasmic reticulum). Degranulation of the rough surfaced reticulum and diminished free ribosomes were also observed. Beginning recovery was evident in surviving animals. These changes showed cumulative tendencies in subacute poisoning, especially in the kidney. Some liver cells appeared to be recovering even during continued adminstration. Daily oral administration of 20 mg/kg of dibutyltin chloride to the rabbit resulted in slight decrease in the peripheral red blood cells and depressed weight gain. There was slight to moderate gastroenteritis and other organ changes.

76-0584. Thielemann, H. (Hyg.-Inst., Martin-Luther-Univ., Halle-Wittenberg, DDR). **Vergleichende Untersuchungen zur Ermittlung der duennschichtchromatographischen Nachweisgrenzen (semiquantitative Bestimmung) von Hexachlorocyclohexan (HCH) an unterschiedlichen Sorptionsschichten.** [**Comparative investigations to determine the limits of thin-layer chromatographic detectability (semiquantitative determination) of hexachlororcyclohexane (BHC) on different sorption layers.**] *Z. Chem.* 15(9): 360-361; 1975. (German)

Different thin-layer chromatographic plates and spray reagents were compared with respect to their sensitivity in the semi-quantitative determination of lindane residues, using *n*-hexane as a solvent. Silufol foil with a Silpearl sorption layer was found to be a better sorption layer for lindane than silica gel D or G, FND foil, or a mixed layer composed of silica gel G and Silpearl. It permitted the achievement of a detection limit of 0.1 μg and semiquantitative determination from 1 μg. Silver nitrate in ammoniacal solution was the best visualizing agent of all reagents tested (bromphenol blue-silver nitrate, rhodamine B with sodium carbonate, methyl red, bromcresol green, silver nitrate-fluorescein, diphenylamine, methyl violet, and methyl orange).

76-0585. Clauss, B.; Acker, L. (Inst. Lebensmittelchem Westfaelische Wilhelms-Univ. Muenster, Muenster/Westf., Germany). **Zur Kontamination von Milch und Milcherzeugnissen mit chlorierten Kohlenwasserstoffen im westfaelischen Raum. I. Methodik.** [**On the contamination of milk and milk products with chlorinated hydrocarbons. I. Methods.**] *Z. Lebensm. Unters.-Forsch.* 159(2): 79-84; 1975. (German)

A method is described for the extraction, cleanup, and gas-chromatographic determination of organochlorine pesticides in milk and milk products in the presence of PCBs. After sodium oxalate is added, the fatty component is extracted from milk by means of ethanol, diethyl ether, and petroleum ether. The fatty extract is purified according to a modification of the method described by Hadorn and Zuercher, using propylene carbonate as a selective solvent and an alumina-packed column. The elution is done with cyclohexane. The concentrated eluate is taken for gas-chromatographic determination, using methane in argon as a carrier gas, one column packed with 2% GE XE-60 on Chromosorb W-HP, and another column with 3% QF1 (silicone oil with 50% methyl and 50% trifluoropropyl side chains) on Chromosorb W-HP. Recovery rates between 80 and 100% were reached for hexachlorobenzene, α-BHC, lindane, hepltachlor epoxide, *p,p'*-DDE, *o,p'*-DDT, dieldrin, *p,p'*-DDD, and *p,p'*-DDT, but the recovery rate was very low for β-BHC. The BHC isomers were distinctly separated. The PCBs did not interfere with the qualitative and quantitative determination of

hexachlorobenzene and BHC isomers, but it was impossible to determine heptachlor epoxide and *p,p'*-DDE quantitatively in the presence of PCBs. Dieldrin and *o,p'*-DDT were detectable on both columns in the presence of PCBs. Heptachlor and dieldrin were identified in the form of heptachlor epoxide and dieldrin.

See also **76-0329** **76-0498**

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

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